

THE IRON AGE

A Review of the Hardware, Iron, Machinery and Metal Trades.

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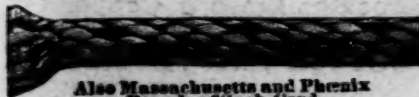
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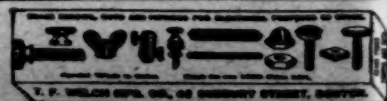
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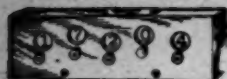
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THURSDAY, DECEMBER 12, 1901.

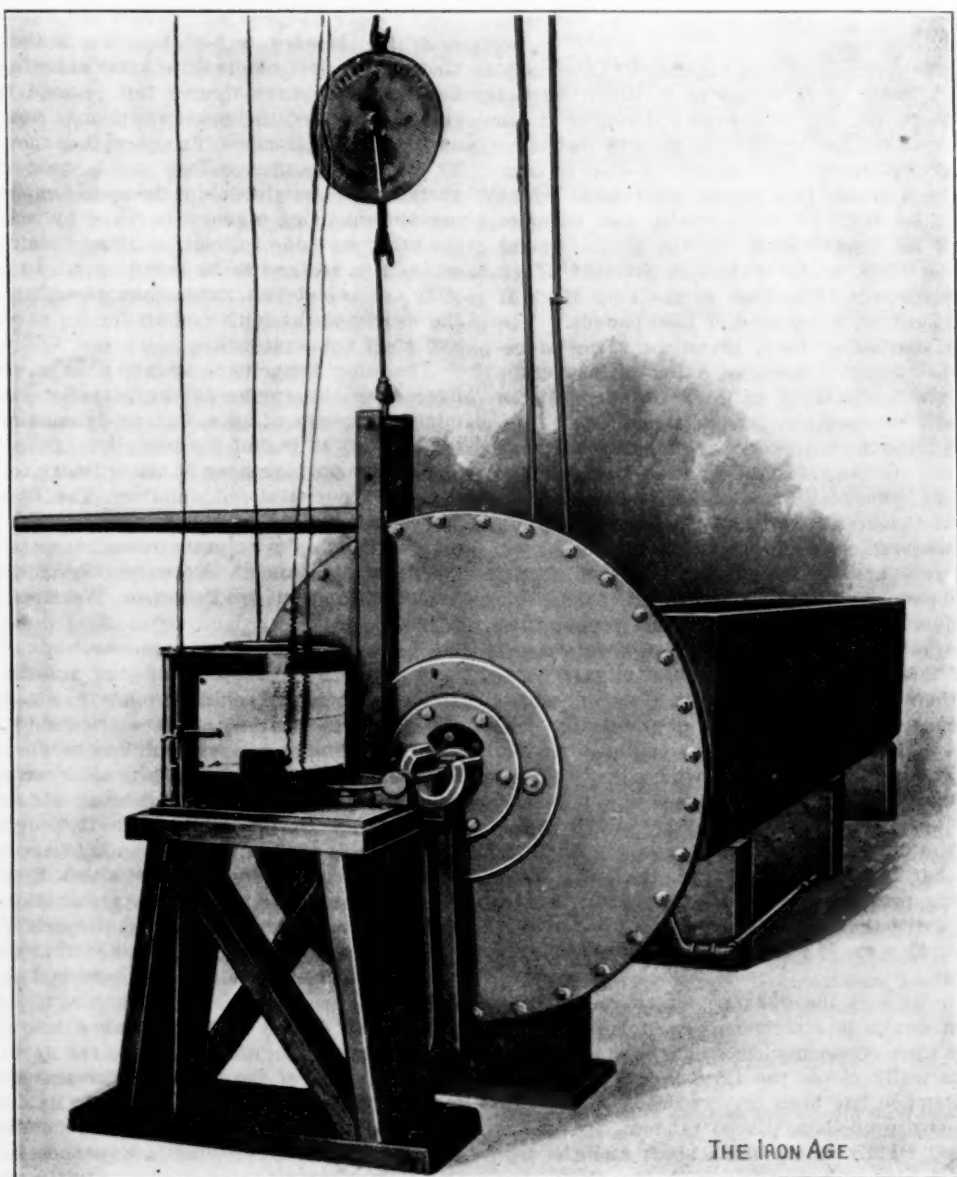
Power Consumed in Propelling the Whitehead Torpedo.*

BY FRANK M. LEAVITT.

The Whitehead torpedo is too well known in its general features and has been too frequently described in various publications to require any special introduc-

the manufacture of these weapons, among which I invite your attention to certain tests which have been made by the writer, with the view of ascertaining the efficiency of the motive power, and the amount of power required to drive the torpedo at various speeds up to 33 knots per hour.

The results of these tests, *per se*, may not be considered a very valuable acquisition to scientific lore.



Final Dynamometer.

POWER CONSUMED IN PROPELLING THE WHITEHEAD TORPEDO.

tion here. It has for many years held a prominent place among the weapons of the principal navies of the world, the last one to adopt it being the United States. Some ten years ago this Government placed its first order for torpedoes with the E. W. Bliss Company, and since that time the latter have furnished all which have been used in the service.

There are many interesting details connected with

* Part of paper read before the Society of Naval Engineers and Marine Architects.

But the apparatus used in making them is quite novel and capable of being efficiently applied in other directions, as, in fact, has since been done.

The trials have also led to certain deductions relative to the frictional resistance of smooth surfaces passing through water, which I believe have a permanent value.

The data here presented are the net results of a large number of tests upon several hundred torpedoes, so that ample opportunity has been had to check and verify the figures.

The trials have consisted of, 1, a series of shop tests of the motive power as measured by an absorbing dynamometer; and, 2, runs made by the torpedo over a measured range under service conditions.

In the latter case, as the operation of the torpedo is beyond observation or control, it would be difficult, not to say impracticable, to attempt any direct measurement of engine performance. These service runs are made for the purpose of fulfilling certain contract requirements, and the only data derived from them bearing upon the problem in hand are, 1, the speed maintained over the range; and, 2, the amount of compressed air expended in driving the torpedo at this speed.

By the shop test the amount of energy exerted at the propeller shaft is determined for each pound of air expended by the engine. By combining the results of these two series of tests the shaft horse-power required to drive the torpedo at the observed speeds may be estimated.

Before proceeding further it may be well to describe, in brief, so much of the torpedo mechanism as has to do with the subject in hand.

Three general types have been furnished to our navy, known as 3.55 Meter Mark I and II, 5 Meter Mark I and 5 Meter Mark II. All three have a diameter at the middle body of 45 cm., or a trifle less than 18 inches.

As is generally known, the motive power is compressed air. It is stored in a strong steel flask, which forms the middle body of the torpedo, and occupies about one-half its displacement. In the short torpedo, and in the long Mark I, the maximum pressure of air carried is 1350 pounds. The flask of the long Mark II is heavier, and carries a pressure of 1500 pounds. The weight of air carried at these pressures varies somewhat with the weather conditions, but will average about 48 pounds in the short torpedo, 65 pounds in the long Mark I and 80 pounds in the long Mark II.

The main engine is of the three-cylinder Brotherhood type, taking air on one side only of the pistons. The three connecting rods work upon a single crank pin, and one cam upon the crank shaft operates in succession the three engine valves, which latter are of the piston type. The valves are set to cut off at one-third the stroke of the pistons.

Air is supplied to the engine through a copper tube leading from the air storage flask. There is interposed in the line of this pipe a starting or throttle valve, and in addition thereto a pressure reducing valve, which latter is so constructed as to cause a practically constant pressure to be maintained at the engine. An adjustment is provided by means of which the working pressure on the engine may be increased or diminished at will. Having a fixed amount of energy stored in the flask, it is quite apparent that the greater the distance it is desired that the torpedo shall run the lower must be the working pressure on the engine. It is possible, therefore, to drive the torpedo at a high speed over a short range or at a lower speed over a correspondingly longer distance.

To regulate at will the distance which the torpedo shall travel, a device is attached to the throttle valve, operated by a train of mechanism from the crank shaft, which automatically closes the throttle when the predetermined distance has been traversed.

There are two propellers, placed tandem. The after one is attached rigidly to the main shaft and the forward one to a sleeve, concentric with the shaft, but made to revolve in the opposite direction by means of a system of miter gears. The propellers must, therefore, of course, be right and left hand. The object of this arrangement is to neutralize the tendency which a single screw would have to rotate the torpedo bodily on its longitudinal axis. As it is entirely submerged and has a metacentric height of only about 3-10 inch, it has not sufficient stability to withstand such a force.

As already stated, the two factors to be determined by the shop test are the weight of air passing through the engine and the corresponding foot pounds of energy delivered at the shaft. The most obvious, and also the most accurate, way to arrive at the first is merely to weigh the air flask before and after the test, the loss in weight being the weight of air used. This method has

frequently been resorted to, but as it involves considerable time and trouble in disconnecting the apparatus another plan has generally been adopted. This consists in attaching a pressure gauge to the flask to enable the pressures therein before and after the test to be noted. Knowing the cubic capacity of the flask, the weight of air can be calculated. This method is open to the objection that at any given pressure the weight of contained air will vary with the temperature. In the process of compression considerable heat is, of course, generated, and notwithstanding that the air is passed through coolers on its way to the flask, it is liable to arrive there at a somewhat higher temperature than the surrounding atmosphere. Furthermore, the work done during the test in expelling the air from the flask leaves that remaining at the end at a considerably lower temperature than the normal. In order to eliminate these errors the whole apparatus is allowed to stand after charging until the temperature has fallen so near to that of the atmosphere that no further drop in the pressure gauge is perceptible, and likewise, after the run, the pressure is not noted until the gauge stops rising. The loss of pressure after charging the flask is generally not more than a few pounds, but after the run is completed the gauge frequently runs up as much as 100 pounds or more. In computing the weight of air by means of gauge readings due allowance is made for variations in weight due to the shop temperature. These precautions being taken, it is found by comparison with the other method of direct weighing that the results are quite accurate and to be relied upon. In order to simplify the calculation, tables have been prepared giving the weight of the contained air for the various pressures and shop temperatures.

The other factor to be arrived at—viz., the energy delivered by the engine at the propeller shaft—is determined by means of an absorbing dynamometer attached to the shaft in lieu of the propellers.

For this purpose none of the ordinary forms of Prong brake were considered suitable. The duration of the test being limited to one minute or less, it would be difficult to obtain accurate measurements with so unwieldy an instrument. Recourse was, therefore, had to a plan suggested by Professor Webb of Stevens Institute.

Dynamometer.

His idea was that a number of smooth metal disks revolving in water could be made to absorb the power of the engine by their surface friction. The rotative tendency would be transmitted to the water, and through it as a medium to the vessel containing it. If, then, the latter were mounted in suitable bearings and free to turn concentrically with the engine shaft, by resisting this tendency with a spring balance the torque could be measured the same as with a Prong brake.

At a given speed of rotation the frictional resistance would be constant, so that, by properly proportioning the areas of the disks, an engine of any given horsepower could be controlled at the desired speed of revolution.

Professor Webb kindly furnished me with a sketch of his idea, but he did not go so far as to suggest the proper number of the disks nor the size they should be made, and I could find no published data to aid me in determining these rather important details. The torpedo itself, however, furnished the necessary information. The formula given below was based on the assumption that the entire thrust of the propellers is absorbed in overcoming the frictional resistance of the torpedo passing through the water, and that this resistance varies as the square of the speed. Also, that the same holds true in regard to the revolving disks.

Let V = velocity of torpedo in feet per second.

A = area of wetted surface of torpedo in square feet.

V_1 = velocity of rotation of disks in feet per second measured at a distance from the center equal to $0.707 \times$ radius.

A_1 = total area of disks in square feet.

R = revolution of disks per second.

r = radius of disks in feet.

N = number of disks.

Then, if our premises are correct, we shall have

$$AV^2 = A_1 V_1^2 \quad (1)$$

and as

$$A_1 = 2\pi r^2 N$$

and

$$V_1 = 1.414\pi r R$$

we may put the equation in the form

$$AV^2 = 123r^2 R^2 N. \quad (2)$$

The area of wetted surface of the short torpedo is 50 square feet, and its mean velocity about 46 feet per second, so that $AV^2 = 105,800$, which, substituted in equation (2), gives

$$N = \frac{860}{r^2 R^2} \quad (3)$$

It was desired that the dynamometer should be so proportioned that the speed of the engine should be controlled at about 900 revolutions per minute, or $R = 15$. Introducing this value in equation (3)

$$N = \frac{3.82}{r^2} \quad (4)$$

The size of disks adopted was 2 feet in diameter, or $r = 1$, so that $N = 3.82$. That is to say, four disks each 2 feet in diameter, revolving in water at 900 revolutions per minute, should absorb fully as much or more power than is required to drive the torpedo through the water at a speed of 46 feet per second.

It will be observed that the combined area of four such disks is just about one-half the area of wetted surface of the torpedo. I did not have sufficient faith in the above calculations to trust entirely to them, and so built the first dynamometer with six disks 2 feet in diameter in place of four. Upon attempting to use it, however, the reasoning was vindicated, and I found it necessary to remove two of the disks.

The shaft was placed upright, and the engine to be tested was secured to a bracket overhead, and its shaft coupled to the dynamometer shaft. The latter entered a cast iron casing placed near the floor and supported by a step bearing. The four steel disks, which were nothing more than ordinary circular saw blanks, without teeth, were keyed to the shaft within the casing. A system of links and levers connected the casing with a spring balance. A dash pot for the purpose of absorbing undue vibrations or fluctuations of speed was attached to the lower end of the rod connecting with the spring balance, but this was found to be quite unnecessary, as the action of the apparatus is remarkably smooth without it. The upper and lower disk cleared the inner faces of the casing by about $\frac{1}{8}$ inch, and the space between the disks was about $\frac{1}{2}$ inch.

In order to prevent the water contained in the casing and lying between the disks from partaking freely of the rotary motion, by which it was thought the frictional resistance would be largely reduced, a stationary disk, having its outer edge rigidly attached to the casing and an opening through the center large enough to amply clear the shaft, was inserted between each of the revolving disks.

If the dynamometer were to be used continuously for any considerable length of time it would be necessary to keep a stream of water running through it, as otherwise the water would quickly boil. For the short runs made with the torpedo engine this precaution is not necessary.

It will be observed that the torque, as measured by the spring balance, varies as the square of the revolutions, and that the horse-power absorbed will be a function of the two.

It is therefore possible to construct a table giving in three columns, respectively, the tension on the spring balance and the corresponding revolutions per minute and horse-power absorbed. For illustration, a table is given below condensed from the one used in connection with this dynamometer:

Tension in pounds.	Revolutions per minute.	Horse-power.
26	802	15.8
30	862	19.6
34	920	23.8
38	974	28.1
42	1,024	32.6
46	1,072	37.3
50	1,118	42.3

The original scope of the trials did not extend beyond making a comparison between newly built engines and those already tested in service runs and known to possess the required efficiency to obtain contract speed. By the aid of such a table as the one above these trials were reduced to a shop routine conducted by the workman in charge of assembling the engines. To make the test he mounted the engine in place and piped it up to an air flask to which a pressure gauge was attached. After noting the gauge pressure he would start the engine at full speed and allow it to run until the pressure in the flask had fallen to about one-half the original pressure, meantime noting the reading of the spring balance. The only mathematical calculation then required of him was to divide the number of pounds drop on the gauge by the noted tension on the spring balance. The result must at least equal a constant which represented the minimum efficiency allowable. If the result fell below this amount the engine was set aside for readjustment. In order to check the result and to know that the dynamometer was in proper working condition a tachometer was attached to its shaft, and the reading of this must correspond with that given in the table opposite the observed tension on the spring balance.

A general formula for this type of dynamometer has been deduced, as follows:

$$H. P. = \frac{TV_1}{550} \times \text{constant.}$$

From formula (2) above, the thrust $T = r^2 R^2 N \times \text{constant}$, and as $V_1 = \pi r R \times \text{constant}$ we can write, after reducing,

$$H. P. = \frac{r^3 R^3 N}{C} \quad (5)$$

For general purposes it is desirable to have the shaft of the dynamometer horizontal in place of vertical, and several have been constructed on this plan. By making the instrument of sufficient capacity it is not necessary that the casing should be entirely filled with water. As a matter of convenience, it is best that the water level, when the shaft is at rest, should be below it, thus avoiding the necessity of stuffing boxes. Under these conditions, as soon as the shaft attains any considerable speed the water is thrown outward and forms a ring entirely around the periphery of the disks. This state of affairs can be taken care of in the formula by writing

$$H. P. = \frac{(r^2 - r_1^2) R^3 N}{C} \quad (6)$$

in which r_1 is the inner radius of the wetted surface.

The horizontal shaft arrangement has an incidental advantage over the vertical in the ease with which various overflow openings for the water may be provided in the casing at different distances from the bottom. By admitting more or less water the resistance at any given speed may be varied, so as better to adapt the instrument to general use.

The value of the constant C may be placed at 600, as I have built several dynamometers in which this condition was fulfilled. It is evident, however, that it would vary to a greater or less degree with the nature of the frictional surfaces.

The following table is based on the formula with $C = 600$:

Horse-Power Absorbed by a Smooth Steel Disk Revolving in Water.							
Diameter of disks.	Revolutions per minute.						
Inches.	600	700	800	900	1,000	1,100	1,200
24.....	1.67	2.04	3.95	5.62	7.71	10.26	13.33
30.....	5.09	8.06	12.04	17.16	23.52	31.32	40.69
36.....	12.65	20.06	29.98	42.71	58.52	77.93	100.15
42.....	27.36	43.37	64.8	92.33	126.5	168.4	218.9

I wish to call especial attention to the great influence which a small increase in the diameter has upon the resistance. It will be observed, for instance, that a disk 3 feet in diameter will require to drive it at 1200 revolutions about 100 horse-power, while if its diameter be increased by 6 inches the power is considerably more than double to maintain the same speed.

The diameter of the propellers of long Mark II torpedo is about 14 inches, and their area about one-fifth that of a disk of the same diameter.

Applying the formula we find that at a speed of 1000 revolutions per minute the power absorbed in overcoming

ing the friction of the two wheels is about one-fourth of 1 horse-power, an amount not worth considering. Suppose, however, that we were to design a torpedo driven by a turbine engine, where the engine speed would have to be about 6000 revolutions per minute, and that we coupled the propellers direct to the engine without gearing. We find that a single disk 12 inches in diameter, or two disks 10½ inches in diameter, would absorb 50 horse-power in overcoming surface friction, the whole probable power of our engine, and propellers of like diameter would waste something like 20 per cent. of our available power. I have no data at hand to make the same calculation in regard to a boat of the turbine class, but I believe it is safe to say that the necessity for small screws and more of them is sufficiently pointed out by the above facts without resorting to any so-called "cavitation" theory.

Final Dynamometer.

The second and more elaborate dynamometer constructed is shown in the engraving here accompanying. The object in this case was to test the motive power and its regulating devices as a whole under conditions as nearly approaching those of actual service as could be had in the shop.

For this purpose, therefore, the torpedo was wholly assembled, with the exception of the propellers, and placed bodily in the tank shown in the background of the photograph, where it was entirely submerged in water. The rear end projected through the end wall of the tank, so as to enable the propeller shaft to be coupled to the dynamometer. The latter was furnished with a single disk 34 inches in diameter.

The casing was supported on roller bearings, and the spring balance for measuring the torque was attached directly to it. In order to obtain a graphic record of the test a drum was provided, so geared to the dynamometer shaft that its surface advanced 1-32 inch for each revolution of the shaft. A vertically moving pencil traversed the face of the drum, operated by the movement of the casing, so that the vertical height of the line above the zero line measured the torque at each instant of the test. For the purpose of recording time a second pencil was placed directly under the other. It was operated by an electro magnet in circuit with a pendulum beating seconds, and made a gap on the card at the end of each second.

The oscillations at the beginning of the card are due to the suddenness with which the engine is started, throwing the weight of the casing against the spring balance, the undulations dying out after a few seconds. The other irregularities in the line are due to the fact that the reducing valve does not maintain an absolutely uniform pressure on the engine throughout the run, and the dynamometer responds to very small changes in the power transmitted to it. In making this test the engine is started by quickly opening the throttle wide

more than 1 or 2 per cent. When an engine is found to fall short of this amount by more than 1 or 2 per cent. it is sent back for readjustment.

At the beginning of a run, whether in the shop or in service, the temperature of the air in the flask is practically that of the surrounding atmosphere. In doing its work, however, its temperature is greatly reduced, the exhaust being extremely cold. If heat is imparted to the air during the run the available energy will, of course, be proportionately increased. Until recently no successful attempt has been made in this direction, owing to difficulties of both a mechanical and military nature. During the past two or three years, however, I have done considerable experimenting along this line, and within the year have furnished the navy with a torpedo equipped with a superheater. This device is arranged to start combustion of a liquid fuel within the air flask at the instant of launching the torpedo. The tests show a net gain of about 40 per cent. in the energy transmitted to the dynamometer, the work done being about 35,000 foot pounds for each pound of air expended, as against 25,000 when the superheater is not in operation.

There is an additional incidental gain in the use of the superheater due to the fact that at the end of the run the air remaining within the flask, being warm, has less weight at the same final pressure than when cold, so that a greater percentage of the whole amount stored will have been used. The net gain in speed of the torpedo due to the superheater is nearly 5 knots per hour.

A torpedo equipped with this device has been in the hands of the Navy Department for some months past, and, although favorably commented upon, has not, at the present writing, been adopted in the service.

In making the tests of the torpedo under service conditions over the measured range the weight of air expended is computed in the same manner as in the case of the shop test already described. The speed is determined by noting, with the aid of a stop watch, the time elapsing from the instant of launch to the passage of the torpedo by the target.

Calling W the total weight of air used up to the target, the gross energy expended in driving the torpedo over the range will be, under normal conditions,

$$\text{foot pounds} = 25,000 W,$$

and where the superheater is in action

$$\text{foot pounds} = 35,000 W,$$

Therefore, if the duration of the run in seconds be denoted by t , we shall have, for the horse-power expended at the shaft,

$$H. P. = \frac{25000 W}{550 t} \text{ for cold air}$$

$$H. P. = \frac{35000 W}{550 t} \text{ for warmed air.}$$

The following table gives a summary of the results deduced from a large number of trials:

Type of torpedo.	Range in yards.	Pressure carried in air flask.	Weight of air used during run. Pounds.	Total work done by engine at shaft. Foot pounds.	Duration of run. Seconds.	Observed speed, knots per hour.	Shaft horse-power.	
3.55 M. Mark I and II....	800	1,350	30	750,000	53.3	26.66	25.6	air cold.
5 M. Mark I.....	800	1,350	42.3	1,057,000	51.6	27.52	37.2	" "
5 M. Mark II.....	800	1,500	44.5	1,112,500	49.8	28.54	40.6	" "
" ".....	800	1,500	51.6	1,806,000	42.4	33.5	77	" hot.
" ".....	1,500	1,500	62	1,550,000	115.5	23.5	24.4	" cold.
" ".....	1,500	1,500	63.4	2,219,000	96.3	27.6	41.9	" hot.

and thereafter leaving the apparatus entirely uncontrolled, save by its own mechanism, until it stops automatically.

The area of the card taken in the manner above outlined gives the total energy delivered to the dynamometer from beginning to end of run. Dividing this by the weight of air used in obtaining it gives us the energy expended for each pound of air used. The general average of some hundreds of tests has established the fact that these engines, run under the conditions given, will exert 25,000 foot pounds of energy for each pound of air expended. The performance never exceeds this amount by more than 4 per cent., and rarely by

The "Eastern States," said to be the largest side wheel passenger boat on the Great Lakes, was launched on Saturday from the Detroit Shipbuilding Company's yards, at Wyandotte, Mich. The vessel, which has been built for the Detroit & Buffalo Navigation Company, is 366 feet in length, 45 foot beam and 19½ feet deep. She will have a passenger carrying capacity of 3500.

Louis T. Brown, general superintendent of the Upper and Lower Union Mills of the Carnegie Steel Company, at Pittsburgh, distributed last week a large amount of 5 per cent. gold bonds to a number of the old employees of these two plants.

Robert Fulton.

Memorial Erected by the American Society of Mechanical Engineers.

A monument to Robert Fulton, erected by the American Society of Mechanical Engineers, was unveiled on the 5th inst. with appropriate ceremonies by members of the society and distinguished guests. The monument stands near the center of the southern side of Trinity churchyard, New York, the body of the inventor of the steamboat resting in the vault of Chancellor Livingston, whose daughter was Fulton's wife. It is of plain granite and bears a bronze portrait of Fulton in high relief, modeled from an oil painting made by Fulton himself, which is now in the possession of the society.

The ceremonies consisted of addresses by Rear Admiral George W. Melville and Prof. R. H. Thurston, and appropriate services in Trinity Church. Admiral Melville said in part:

Address by Admiral Melville.

We are assembled here to do honor to the memory of a great American and a great engineer—to the memory of one whose work led, in its development, to the utmost benefits and blessings to mankind. Without exaggeration, it can be truly said that among the world's foremost benefactors stands Robert Fulton, the American engineer, whose monument we are dedicating to-day.

When we reflect upon the changes produced by the successful application of steam to navigation—when we attempt to mentally span the entire period from the beginning of this mighty industry down to its present magnificent fruition—we realize that the advance of time has brought almost another world. Upon the sea to-day are borne great fleets of swift and safe commerce carriers; and to-day powerful steamships proudly fly the flags of nations in all quarters of the globe. Repeatedly the records for speed have been broken by the transatlantic liners, and the close of the past century witnessed the triumphant sweep over the ocean of a "Columbia" and of an "Oregon."

Work of Fulton.

Though Fulton's achievements were not at first thoroughly understood, nor appreciated, by his countrymen, and though he has not been always given that credit which he deserves by foreign writers, it may be said that the success of Fulton in the practical establishment of steam navigation was so marked an event in history that since his death his memory has been honored by the American people and his merits generally recognized the world over. Of him there have been scores of memorials written, and in different periods of our history Government and merchant vessels have borne his name. Other substantial marks of respect have been paid to his memory. Here in New York you have daily reminders of Fulton in the "Fulton Ferry" (which he started and which up to the time of the construction of the Brooklyn Bridge was the chief means of transportation between New York and Brooklyn), and in Fulton street, and in the Fulton Market.

Toward the close of the eighteenth century, when the steam engine had but lately been sent forth on its world-wide mission by its master, it is natural that the thoughts and energies of many men should turn to the application of so marvelous a factor for material development—a factor fraught with such practical promise. Connected with the introduction of that important branch of the steam engine's application, steam navigation, history discloses a cluster of inventors, engineers or mechanics, of different nationalities (including a number of Americans besides Robert Fulton), of varying force of character, originality, mechanical aptitude and business ability.

It is not likely, after this lapse of history, when the merits of the different men who attempted to construct a commercially successful steamboat have been thoroughly sifted, that our patriotism would obscure our judgment, and that we should laud Fulton at the expense of others. It is sufficient to say that Fulton was

aided in his work by the efforts and partial success of those who had gone before him, and by the general and scientific knowledge and engineering experience of his time, as well as by the acquaintance of some of the most able and enterprising men that were engaged in the solution of the world's problems, including Watt himself. He had also the financial aid and the friendship of his fellow countryman, Chancellor Livingston, much in the same way that Watt had the material support and encouragement of Mr. Boulton. But these advantages of themselves could not have insured success, which was the result of Fulton's progressive and courageous spirit, his adaptive and resourceful mind, his originality, practical judgment, and unremitting labor. Without doubt, Fulton must be acknowledged to have made that valuable contribution to the world's progress—the commercial establishment of steam navigation. The claims of any man, of any nation, cannot take from the American engineer, Fulton, that success which the unanswerable logic of his deeds awards him.

"One thing is forever good;
That one thing is success."

Our present conception of the term "invention" is much wider and more definite than in the past, and it is seen to be more closely connected with scientific experiment and engineering efficiency than was formerly supposed. The inventor in the truest sense of the term is he who, besides having the originaive faculty, possesses wide scientific knowledge and practical skill in the design of, and experience with, existing forms of machinery. In addition to these qualities, for an inventor to achieve commercial success with his invention, there must be a natural demand for it, and he must possess the courage and perseverance, the financial means and the practical ability to put it upon a business basis, or else must intrust it wholly or partly to the hands of others to do so. The necessity for all of these qualities becomes greater as the machine becomes more complex.

Fulton Invented the Steamboat.

Generally speaking, Fulton's claims as the first inventor of the practical steamboat cannot be disputed, since it proved its utility in actual service. As a rule, a great mechanical invention is the outgrowth of the combined efforts of several inventors of more than one nation, and in a general sense may be said to be common scientific knowledge; but to the man who actually makes a commercial success of an invention due credit always must be given. Fulton commercially created the steamboat.

There can be no doubt of Fulton's power of originality, which (besides being evinced by his work of proportioning the machinery to the hull of his vessels, and by the improvements which he made to each successive boat as it was built) may be seen in the work of his whole life, which was in great part taken up with invention and the projection of plans for the world's welfare. Fulton possessed scientific knowledge and practical skill, was a progressive engineer, and his great work in the establishment and subsequent improvement of the commercial steamboat was built upon a firm foundation. In this method we note the most careful procedure and the most approved ways and means to attain the results desired. He did not trust to vague theory, but worked out all details and thoroughly tried everything that might be in doubt before attempting to introduce it into actual use.

In securing the confidence and aid of friends Fulton may be said to have had "good fortune," which is at best a most unsatisfactory and indefinite term; but all other requisites for the commercial success of a marked and timely application in the use of the steam engine Fulton either naturally possessed or else acquired by his industry.

Let us not permit our knowledge of the present advanced state of marine engineering efficiency and practice to dim our conception of Fulton's great work. Let us recognize his great achievement. Let us give all honor to Fulton, who, by his courage, energy and determination; by his knowledge, skill and practical enterprise; through combat and stress, through trial and labor, through discour-

agement and inappreciation, overcame opposition, beat down the barriers of conservatism and turned cold indifference into fervid enthusiasm and sneering ignorance into unfeigned wonder. As one possessing the power of invention, or that which is often its practical equivalent, great ability as a progressive engineer and as a business man, Fulton lives in the fame that he so justly earned.

Early Life of Fulton.

Robert Fulton was born in Lancaster County, Pennsylvania, in 1765. At an early age he evinced talent as an artist, and by the time he was 21 had achieved such success in painting that he was able to buy a farm for his widowed mother. On the advice of friends, he then went to England to seek aid from the famous American, Benjamin West, in the further development of his

life. From views expressed by Fulton about this time (1793) in a letter to Earl Stanhope, on the practicability of a plan for steam navigation, it is the opinion of competent authorities that had Fulton been given the opportunity to then test such views the commercial steamboat would have been a fact ten years prior to the success of the "Clermont," which was launched in 1807.

By 1795, having added to his stock of mechanical knowledge and won honors as an inventor, Fulton was a civil engineer and was writing extensively on technical subjects. He was particularly interested in inland navigation and appreciated its value as a means for the internal development of the United States.

Crossing the Channel to France in 1797, he formed the acquaintance, in Paris, of Mr. Barlow, who became his life long friend. At this time, besides pursuing other studies, Fulton gained a better knowledge of mathe-



ROBERT FULTON MEMORIAL.

talent for painting. After studying with Mr. West for several years Fulton started out on his independent career as an artist.

Soon making the acquaintance of several men of science and mechanical ability, the spirit of his true genius—that of mechanics—which had been sleeping, awoke, and urged him onward to the fulfillment of his destiny. In his earliest days Fulton's true bent had asserted itself. As a boy, he had fashioned a paddle which worked by a crank, to save himself and his companions the fatigue of poling their boat in their youthful fishing trips on the Conestoga. Moreover, much of his spare time as a lad had been spent among the artisans in the workshops near his home, and before adopting the career of an artist he had learned the trade of a watch maker.

Seven years after his arrival in England we find Fulton, then only 28 years of age, thoroughly impressed with the idea of the practicability of the steamboat, to which so much of his best thoughts and energies were devoted throughout a great part of the remainder of his

matrics and physics. It was while in Paris that Fulton experimented with submarine explosives and torpedo boats. When engaged in experimenting with torpedoes, a man possessing such practical judgment as Fulton must have realized that these weapons could never prove of great value as long as the vessel using them was dependent on the wind, so that we find him in 1801 turning to the effort to make the steamboat a success. These efforts, with the encouragement and active co-operation of his friend, Chancellor Livingston, were continued at different times, both in France and England, up to the date of Fulton's return to the United States, which was in 1806. He then worked steadily on his great project, and shortly after was rewarded with success.

[The] "Clermont." ■■■■

It was in the early part of the year 1807 that the "Clermont," fitted with one of Boulton and Watt's engines, which Fulton had ordered from England before he left the United States—was launched, from the build-

ing yard of Charles Brown on the East Hudson. At 1 o'clock on the 7th day of August, 1807, the "Clermont" began her first trip from New York to Albany.

In a letter to Mr. Barlow, Fulton describes this memorable trip. He says:

"My steamboat voyage to Albany and back has turned out rather more favorable than I had calculated. The distance from New York to Albany is 150 miles; I ran it up in 32 hours and down in 30. I had a light breeze against me the whole way, goth going and coming, and the voyage has been performed wholly by the power of the steam engine. I overtook many sloops and schooners beating to windward, and parted with them as if they had been at anchor. The power of propelling boats by steam is now fully proved. The morning I left New York there were not perhaps 30 persons in the city who believed that the boat would ever move one mile an hour, or be of the least utility; and while we were putting off from the wharf, which was crowded with spectators, I heard a number of sarcastic remarks. This is the way in which ignorant men compliment what they call philosophers and projectors. Having employed much time, money and zeal in accomplishing this work, it gives me, as it will you, great pleasure to see it fully answer my expectations. It will give a cheap and quick conveyance to the merchandise on the Mississippi, Missouri, and other great rivers which are now laying open their treasures to the enterprise of our countrymen; and although the prospect of personal emolument has been some inducement to me, yet I feel infinitely more pleasure in reflecting on the immense advantage that my country will derive from the invention."

This voyage established steam navigation, and the "Clermont" henceforth made regular trips between New York and Albany. The "Clermont" was of 160 tons, was 133 feet long, 18 feet beam and 7 feet deep. The paddle wheels were 15 feet in diameter, with buckets 4 feet long, with a dip of 2 feet. Later her keel was lengthened to 140 feet.

Once the steamboat became a commercial fact Fulton was too thorough an engineer to consider his work as accomplished, but immediately began to remedy all defects, which materially increased the "Clermont's" efficiency. And as each new boat was put into service on the Hudson she was an improvement over the one preceding.

Chancellor Livingston was still associated with Fulton, and in 1811 they built and put into service the first steamboat on the Mississippi, which was named "Orleans." So well was the work builded by Fulton that we may say that in its basic principles it still lives—greatly developed, it is true, but still not so changed that any one could venture to declare that Fulton's share was of little value.

To-day there is a word ringing around the world—it is

Engineer.

Thousands of eyes are turned upon him, and he is the object of the closest scrutiny. Amid such public notice, it is natural that the engineer should be far more conscious of what is required of him than he was in the past; and he is at present regarding himself most earnestly. He does not do this merely to dwell with complacency on his achievements, nor to exaggerate his importance to human welfare (though he may take a proper pride in this), but he is subjecting himself to the most searching analysis to get a fuller realization of his duties and responsibilities and to thus attain to the greatest possible light of usefulness.

The modern American engineer is wedded to the business world, is an industrial leader, and is a true political economist. He is vitally connected with the efficiency of military organizations, holds a high place in the army or navy, and is particularly fitted to understand and apply the principles of war.

Fulton was a member of the original family of American engineers, and the American engineer of the hour is his direct descendant. Fulton was an engineer of character, mindful of his duty and responsibility; an engineer who strove to promote the welfare of his country in peace and war; an engineer who realized the im-

portance of the organization and efficiency of men, as well as of machines; an engineer who regarded industrial relations from the viewpoint of a practical business man, and an engineer whose dominating purpose was to promote the peace and prosperity of the whole world, and to increase the stability and means for defense of his own country; but an engineer who did not permit his lofty conceptions of universal brotherhood and happiness to obstruct that practical habit of thought and course of action which are necessary if prolonged hostilities are to be avoided and if material benefit is to be bestowed upon the majority of men.

But Fulton was also a distinguished member of the original family of American engineers. Fulton was an engineer of exceptional courage, foresight, and mechanical and business ability, which enabled him to achieve great success. As such, he was a great man, a great American, and a great engineer.

Fulton Built First Steam War Ship.

To Fulton belongs the honor not only of having constructed the first commercially successful steamboat for purposes of commerce, but of having built the first steam war vessel in the history of the world. She was the "Demologos," afterward called "Fulton the First." Her keel was laid on June 20, 1814, in this city, and she was launched October 20, in the sight of thousands of spectators. Difficulties in procuring labor and the untimely death of Fulton on February 24, 1815, caused serious delays in the completion of the "Demologos." On her first trial trip, in June, 1815, the soundness of Fulton's views, and the fact that a heavy floating battery could be propelled by steam, were established. Her two subsequent trials further demonstrated her success, her speed exceeding Fulton's guarantee to the Government. Peace being declared, there was no opportunity to test the vessel in actual combat, and the "Demologos" was sent to the Brooklyn Navy Yard for a receiving ship, remaining there until June 18, 1820, on which date she was blown up, either by accident or design. The "Demologos" was a double-ended, twin-hulled floating battery of 2475 tons, carrying 20 32-pounder guns, protected by 4 feet 10 inches of solid timber. These guns were to fire red hot balls. The machinery was calculated for the addition of an engine to discharge an immense column of water, intended to be thrown upon the decks and all through the ports of an enemy. In addition to all this, two 100-pounder columbiads were to be suspended from each bow, so as to discharge a ball of that size into an enemy's ship, 10 or 12 feet below the water line. It is not surprising that she was, in her day, described as being "the most formidable engine of warfare that human ingenuity has contrived." The "Demologos" was driven by a single central paddle wheel; her speed was 4½ miles per hour, and she was both handy and seaworthy.

There is living in New York to-day a veritable veteran of the engineering profession, who as a boy saw the "Clermont" and the "Demologos," and who as a young man was the designer of the machinery for the second war steamer of the United States, which was called "Fulton the Second." He was also the first engineer officer to be appointed in our navy, and, later, he had the honor to become engineer-in-chief. To bridge such a period of history, and to have played so important a part in it, is a privilege which comes to very few of us; but this privilege has come, as most of you know without the telling, to Charles H. Haswell.

When reviewing the world's progress during the nineteenth century, we see that its grandest glory was gained by the steam engine, which has been styled its "Hero." The work of the stationary steam engine is epitomized in the phrase "increased production," and the work of the locomotive steam engine on both land and sea is epitomized in the phrase "increased distribution." With these two phrases, the history of the material progress of the world may be said to be written.

Fulton's Character.

We see in Fulton all the qualities that make for the success of America—character, courage, perseverance, energy, enterprise and skill. We see in Fulton the true-

American spirit—a high, hopeful, progressive, liberty loving and practical spirit. Fulton was high minded and generous; he was true to his friends in their adversity. He was noted for his amiable disposition and genial hospitality. It was said of him that he was “a gentleman in mind and manners.” He was a man of refined tastes, and, besides his active efforts during the most of his lifetime for the promotion of the mechanic arts, it was his endeavor to foster a love for the fine arts, and falling in his project to establish an art gallery in America, he bequeathed to our Government at his death two of West’s masterpieces which were his most prized and valued possessions.

In closing, it is fitting to reiterate that as an inventor Fulton earned the highest crown that he could earn—success—and his name should be honored by all inventors. As an engineer, Fulton did all that he could do to promote the welfare of the world, and his name should be honored by all engineers. As an American, Fulton was a true type, and gained glory for his country, and his name should be honored by all Americans. As such, Robert Fulton was a great engineer, a great American, and a great man, and his memory should be respected the world over and his name ever revered by our people.

The St. Louis Fair Power Plant.

ST. LOUIS, Mo., December 8, 1901.—The Committee on Grounds and Buildings of the Louisiana Purchase Exposition has been struggling for ten days with the power plant problem, holding meetings almost daily. Four definite propositions are before the committee, submitted by the General Electric Mfg. Company, the Westinghouse Electric Mfg. Company, the Bullock Electric Mfg. Company, and the Citizens’ Lighting & Power Company of St. Louis. These propositions are on different apparatus and contemplate different methods of transmission and transformation of current and different phase current generators. All these propositions had to be reduced to a common denominator that they might be compared. This is the work on which the Department of Works has been engaged. The common ground selected for comparison was the ratio between the cost of the plant in operation and the efficiency of the plant. Even after this reduction was effected the comparison required the consideration of many points on which the contractors laid stress, such as the simplicity of the apparatus, the light gauge of the copper wire required for transmission, &c.

The wide variance in the propositions of the bidders is shown by the fact that not only is each bidding on the special machinery whose patents are controlled by his concern, but he is bidding by units as well for the entire plant. One of the bidders is even offering to deliver the current at the exposition without the necessity of putting a plant on the grounds.

This complicates the matter very much, because to compare this proposition with the others it is necessary to know the exact condition in which the current will be delivered and the exact condition in which it is to be used. This controls the intermediate machinery which must be supplied to handle the current. For instance, if an alternating is transmitted and a direct current is needed, transformers of sufficient power must be interposed and the expense of these machines must be embraced in order to determine the relative merit of the bid.

It is not likely that a definite conclusion with regard to the propositions will be reached before a week or ten days. The question of the location of the plant is not connected with the question of the lowest and best bidder. The location depends on the question of fuel and on whether the plant is to be an exhibit or a service plant. If it is to be an exhibit plant, it must be located in one of the big buildings. If it is to be a service plant it must be placed in some corner of the grounds as unobtrusively as possible.

The plant will be required to develop not less than 25,000 horse-power.

The Cost of Object Lessons.

The commissioners from several English railways of importance, who have been visiting this country for some weeks past, have completed their task and exhaustively reviewed the systems in use here over many lines of track. In the course of their investigations every facility was given them to see for themselves what the best practice was here in all departments, and, as one element, a run over a certain line at high speed was made. The train consisted of five cars weighing over 200 long tons behind the tender, and the run of 55½ miles was made in 46½ minutes, a rate of 71.6 miles per hour. There were no stops, but three checks were encountered. Thirty-five miles were run at the rate of 81½ miles per hour, and one mile at the rate of 85.7 miles per hour; the last two miles were run in 120 seconds to a dead stop at the terminus. This was not an exhibition run, but one that could be duplicated when a clear right of way could be had.

The commissioners aforesaid have expressed themselves as amazed at the difference between our railroad practice and their own, especially in the loads hauled by one engine in freight traffic, instancing our trains weighing 1500 tons of dead load, as against their loads of 800 tons taken by one engine, but the load mentioned as a maximum for American locomotives is very far from the capacity of the new high powered locomotives recently built for the New York Central, which have hauled 4000 tons at 15 miles per hour upon a level track. For years the principal coal roads have hauled over 2500 tons with ordinary steam pressures, so that the draft power of English locomotives is, by their own admission, about one-third of the American engine, equal types being assumed. Various reasons are assigned for this difference by English technical journals, one of which is that the policy of their railway managers is different from ours, and that the service is also different, in that light loads have to be hauled at high speeds; but the commissioners who were here seemed to feel that the policy would have to be changed if the English roads were to pay dividends, and this change involved entire remodeling of the freight engines.

What this means can be well understood by engineers without animadversion, but the missionary work to be undertaken before the change alluded to is authorized even, let alone actually put on foot, is vast. The British mind and the British capitalist are averse to change, and before any new system can be inaugurated the amount of discussion and argument which will be needed is appalling to consider. The work of renewal comes afterward, and here again there are obstacles of great magnitude to be overcome. Those persons who have been in this country and have their impressions fresh in mind will be met by the doubting Thomases, who have seen nothing, and flatly deny possibilities as to the work done by American engines, and if this is adjusted upon the basis of half American and half English practice, there still remains the cars, or wagons as they are termed in England, to be remodeled in fastenings and running gear before they will be able to stand heavier burdens. This last detail is, in fact, a great stumbling block in our own railway practice, for it is difficult to make couplings and drawbar attachments to resist the draft on long trains.

From these brief citations it will be seen that it is costly to take object lessons if they are likely to result in changes of national policy, either in diplomacy or the ruder art of transporting merchandise. It is also instructive to other nations as to the cost of adhering to manners and customs which have become obsolete. It is more than doubtful whether any consideration that can be advanced will serve to swerve the officers in charge of English railways from the traditions of years. We are told that “art is long and time is fleeting,” but the capacity of the English mind for stolidly sticking to one point of view—their own point—is beyond comparison with anything else in animated nature.

The Atalanta Technical Agency.

The Atalanta Technical Agency, engineers and manufacturers' agents, of St. Petersburg, Russia, consists of three partners, who are thoroughly familiar with the language, business methods and facilities both of that and our own country.

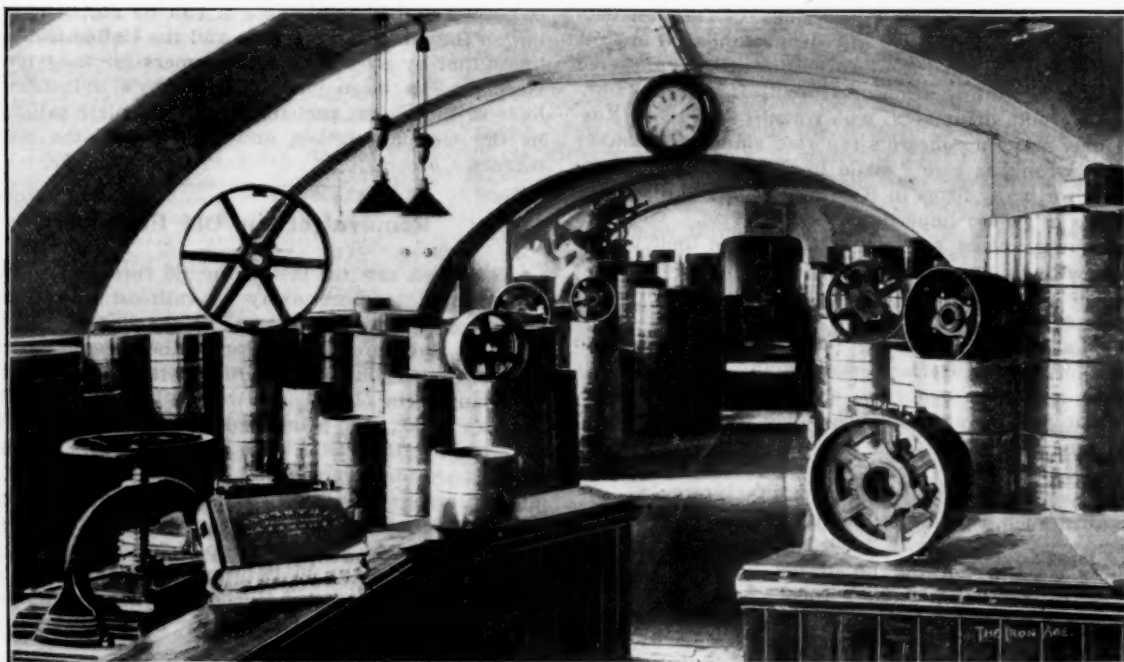
The Atalanta Technical Agency have been representing for a number of years the Niles Tool Works and the Pond Machine Tool Company, for which concerns they have effected very creditable deals in Russia; in fact, their principal and special business is the introduction and sale in Russia of American machinery and machinists' supplies. The firm have a large warehouse, the accompanying engraving showing a portion of a storeroom stocked with American steel pulleys, this probably being the largest stock of pulleys carried by any firm in Russia.

The proprietors of the Atalanta Technical Agency are James Pulman, Frank Riches and Arthur R. Schultz, the latter having joined the firm in partnership quite recently. James Pulman is sole proprietor of a large engineering concern in St. Petersburg, the Kathrinehoff

tion, he called attention to some of the methods by which German manufacturers are manipulating their business in Russia.

German Manufacturers in Russia.

Russia as a foreign market strikingly differs in its conditions and ways from most other foreign markets more or less familiar to Americans. The acquisition of the Russian language baffles any linguist. The character of the people and business methods there in vogue considerably deviate from those familiar to an American from any experience he might have had in any other foreign country, not to speak of that gathered in his own. On the other hand, Russians as yet have very little knowledge of Americans or of their country and its enormous resources. Most business between the two countries has been carried on through the medium of German commission houses, the Russian market more than any other being, so to say, monopolized and eagerly watched by Germany. The German element in Russia, although thoroughly disliked, forms a clique snugly settled in that market, and is at great odds with anything "not made in Germany." For the latter reason Ameri-



Portion of Pulley Stock.

THE ATALANTA TECHNICAL AGENCY.

Engine Works. He is a British subject who has spent the best part of his life in Russia. Frank Riches is also an Englishman who settled in Russia many years ago, and has earned for himself a reputation as an engineer. The fastest steam yacht in Russia, the "Daisy," was designed and constructed by Mr. Riches. He holds for several years the position of sole representative for Russia of the Carnegie and Bethlehem Steel companies, in which capacity he secured from the Russian Government large armor plate contracts. Arthur R. Schultz is an hereditary "notable" citizen of the Czar's domain, but he would pass for a well acclimatized American. He has lived for many years in America, and before joining the Atalanta he was engaged for ten years in the sale and distribution of American machinery in Europe. In his native country he has been the representative for several American manufacturers. Many of our readers will recognize in him the party who, by his personal endeavors, paved the way for their goods in Russia. He is at present again on a visit to this country, and stopping at the Brevoort House, New York.

In the course of conversation with Mr. Schultz, who has had considerable experience in the export trade and during his extensive travels through Europe, America and Asia has had exceptional opportunities for observa-

cans who wish to enter into direct business relations with Russia on an unhampered and sound footing (we mean the establishment of a lasting, well regulated trade and not occasional single transactions) must be careful in the choice of proper agents to whom they assign the representation of their interests in Russia. This is of the utmost importance. The firm or individual to whom the representation of American interests in Russia is assigned must be one who knows something of America and Americans, and who, by a sufficient quantity of air breathed in America, has got that which is not only consistent with, but in a measure quite necessary for, business enthusiasm—the enthusiasm for the "made in America" in no less degree than what the German clique has for the hackneyed "made in Germany."

The usual method for an American manufacturer who wishes to sell his product in Russia independent of commission houses is to look about for one of the established concerns in that country, and in making his choice he is principally or even entirely guided by the commercial report about their financial standing. If the report furnished by the information bureau sounds favorable, the firm are appointed sole agents for Russia. It is the financial standing only, reported by friend or enemy of a given concern, which influences the American manu-

facturer in his decision. No attention is paid to the history of the concern, to their individuality, to their knowledge of and their sentiments toward America or Americans, and their disposition in regard to how they will take care of their American connection. And yet it is at least just as important to ascertain these qualities as to ascertain the financial standing. A report furnishing the latter information may be colored to suit the reporter or the concern he is reporting about; again, even a correctly reported financial standing is subject to very sudden, unlooked for changes, and in itself and alone is not a sufficient criterion for American manufacturers who wish to have their interests fairly and squarely dealt with. This is particularly important for connections with Russia.

It is a fact that most firms in Russia dealing in machinery and kindred lines are either Germans or of German extraction, and such of these concerns who may be correctly reported as of wealth and fair business standing owe their success and standing chiefly to the support accorded them by German manufacturers and German bankers. In their eagerness to have a good grip on the Russian market German producers and German bankers made the widest possible concessions to German concerns, and if the standing of any firm established in Russia is to be ascertained the information will be gathered by a German "information creature." It will be amplified by German drummers, who travel in shoals in Russia. Thus many a concern's reported standing, whether right or wrong, is also "made in Germany." No wonder that for many firms in Russia their German connections are of prime importance and interest. They are nearer to their heart and taste and closer to their pocket and understanding. Plainly enough, this leaning of Germans toward Germans beyond the German frontier is not based on abstract love for the Fatherland, but on materialistic interests in the shape of those extensive concessions which German manufacturers grant their brethren in foreign countries, and especially in Russia. It roots in the liberal assistance which they are given in every conceivable way and manner, with the ultimate end in view to capture and hold as much of the Russian market as possible for German manufacturers.

Against such a plan of campaign, such a well defined system, what show has an American manufacturer who would place the working up of his interests into the hands of a concern who, may their "standing" be reported ever so satisfactory, have as a matter of fact nothing in common with Americans? Ordinarily, such Germanized concerns will take up the representation of American producers with the intent, firstly, to prevent a given representation or agency going to some one else, and, secondly, to promote the interests of their American connection only in those cases where they cannot help it, where getting around the American interests is impossible for reasons beyond the German control. A poor chance for Americans!

It is an old saying that history repeats itself. England lost and is losing one market after another, one line of export after another. Why? Because English manufacturers, being so sure that their business methods are all that can be desired (and for that matter they may have been good enough in their time), would not adapt them to changed conditions. So far as Russia is concerned the bulk of England's trade was systematically and quietly sidetracked by Germany.

Not more than 25 years ago England had an enormous trade in Russia, when that country awoke to the recognition of her boundless natural resources and commenced to develop them, in the direction of agriculture, of mining, of establishing industries in all lines of manufacture and of constructing railroads; all that at a pace and on a scale unprecedented in the history of any other country, except our own. Hardware, small tools, cutlery, machinery and implements of every description, engines, boilers, railroad material, &c., was imported from England. The name "English" was suggestive of and synonymous with a high grade and sterling quality of goods. What has become of all that? Nearly all that trade now is gone. Who got it? Germany. For what reason? Well, making allowances

for changes in the condition of the world's production, which placed England at a disadvantage in certain branches of industry, it is safe to say that England was beaten out of the field chiefly because she had no champions in the person of adequate representatives to watch and fight for her interests. Germany knew better, and provided herself with a whole army of them, well paid, well protected and well supported by German manufacturers. This army of representatives of all shades and grades, nicknamed by the Russians "Culturtraeger," slowly but steadily invaded the Russian market by a system of coercion partly above described. And as the world runs, a good trade balance with a nation draws with it political prestige and power. For this very reason it is not the American, but the German "invasion," that is to be feared. Russia has had enough of the latter. In the course of the present year, a Russian paper showed in plain figures what the German "friendship" had cost Russia. In vain at this moment Germany threatens to increase the tax on her people's stomach, in order to put the screw to some of her best customers for the goods "made in Germany." Both customers know well enough that Germany will buy her bread only if it is needed and known where it can be gotten cheapest, but on the other hand, Russia and the United States also know that by ceasing to be customers for the "made in Germany," a large part of Germany's industries will have to shut down, probably to the complete satisfaction of the German nation, and particularly the working masses.

Removal of an Old Furnace.

This week saw the last of the old furnace at Duncannon, for it was torn away by railroad contractors to make room for improvements to the line of the Pennsylvania Railroad, and its site will be covered by tracks, and an extension of the mills of the Duncannon Iron Company. The old furnace was built in 1853 by Fisher, Morgan & Co., who afterward sold it to the well-known firm of J. & R. Wister, who also operated a furnace in Harrisburg for several years. It was originally 60 x 15, and was rebuilt in 1880. It went out of blast in the eighties. The removal of this furnace takes away almost the last of a famous group of furnaces which made Perry County, Pa., a lively iron producing section many years ago. The Marshal Furnace is the only active furnace in the country, which is now noted for its lumber.

The Highland Iron & Steel Company.—The new rolling mill plant of the Highland Iron & Steel Company, Terre Haute, Ind., has been completed and put in operation, manufacturing bar iron and steel. The plant comprises six double puddling furnaces, two busheling furnaces, two furnaces using scrap piled on boards, one 20-inch puddle mill, one 20-inch bar mill and one 10-inch guide mill with 12-inch Belgian roughing rolls. The finishing mills are equipped with Lauth heating furnaces. The boilers are of the waste heat type and are attached to the heating and puddling furnaces. The machinery is all new and of the most modern type obtainable. It is advantageously situated as to drainage, water supplies, &c., and is provided with elevated tracks and other appliances for the convenient handling of material. The product of the works will consist principally of bar iron, shapes, bands, &c. Particular attention will be paid to the manufacture of special grade and test iron. The company made their first shipment of bar iron on November 28, this shipment consisting of iron to be used in the manufacture of wagon tires by the Studebaker Bros. Mfg. Company, South Bend, Ind. The officers of the company are as follows: Philip Matter, president; John L. Smith, vice-president; William M. Myers, secretary, and Walter C. Ely, treasurer and general manager.

Two additional hot mills have been placed in operation at the plant of the Waynesburg Forge, Sheet & Tin Mill Company, Waynesburg, Pa., and several additional mills are shortly to be built.

The Shipments of the Minnesota Mines.

DULUTH, MINN., December 7, 1901.—All upper lake ports have ceased shipment of iron ore for the year. The figures of shipments of Michigan and Wisconsin mines are not yet all available, but the figures of Minnesota mines are as follows, in detail:

<i>The Shipments of Minnesota Iron Mines.</i>		
Mesaba range.	1901.	1900.
Adams	829,118	777,346
Ainslie .....	.....	172,597
Auburn	427,510	263,692
Blwabik	410,075	924,868
Clark	199,565	63,071
Commodore	35,547	278,416
Duluth	150,024	128,587
Elba	224,629	121,707
Fayal	1,656,836	1,252,504
Franklin	38,840	168,524
Genoa	332,021	243,651
Hale	30,972	32,901
Hibbing group	584,778	284,023
Kanawha	41,300	64,218
Mahoning	778,540	911,021
Malta	128,220	65,346
Mountain Iron	1,058,160	1,001,324
Oliver and Lone Jack	5,420	244,876
Penobscot	220,000	146,641
Pillsbury	120,708	101,032
Roberts	42,757	41,965
Sauntry	328,739	68,560
Sellers	34,918	56,280
Sparta	154,557	202,144
Spruce	279,175	101,675
Stevenson	666,036	56,031
Union	93,109	8,297
Williams .....	.....	18,238
Corsica	26,837	.....
Chisholm	34,573	.....
Sharon	64,000	.....
Totals	9,001,769	7,809,535
Vermillion range.		
Chandler	627,322	644,801
Minnesota	208,284	325,020
Pioneer	678,301	450,794
Savoy	212,007	175,116
Zenith	60,037	60,080
Totals	1,785,951	1,655,820

The Stevenson mine of Corrigan, McKinney & Co., of which Geo. W. Wallace is the very efficient and skillful manager, has made a remarkable shipment. This is to all intents and purposes its first year, though it made a shipment of 56,000 tons the season before, all from under ground. At the close of the season of 1900 a stock pile of about 70,000 tons was raised for early shipment of 1901, and the underground workings were then abandoned and a stripping contract let to the Drake & Stratton Company. On this stripping two and three shovels were maintained all winter and during the past summer. Early in July shipment begun with a 110-ton shovel in the ore, and about 600,000 tons have been sent down from this opening, 666,036 tons in all. At the commencement of shipment from the mine this correspondence stated that it would not be possible that so much ore should be delivered as the 750,000 tons that Corrigan, McKinney & Co. stated that they would ship, and to that opinion the firm took violent and decided objection. It is probably not the fault of the mine that the 750,000-ton mark has not been reached this year, but it has not been, and whether the difference of 85,000 tons is the result of a lack of cars, as Corrigan, McKinney & Co. claim, or of other causes, has no bearing on the fact. In any event the mine has made a wonderful record, several times greater than has ever been reached by any mine in a similar period of its development, and the owners have great reason to be proud of what has been accomplished by Manager Wallace. There are probably few men in the Lake region that could have accomplished as much. It is now expected by the owners and by Mr. Wallace that the mine will the coming season ship 1,500,000 tons, and in order to do this a vast amount of stripping will be carried on during the next year.

The record of the Fayal mine is a remarkable one. It would have been about 35,000 tons greater but for the difficulty of handling some of the grades wanted close to the close of the year. The Fayal is operating

both underground and on surface and will be largely extended by new work during the present winter.

The gross shipment of ore through the Sault canals for November was 1,474,500 tons, making the season to December 1 of all ports on Lake Superior 16,020,800 gross tons. To this are to be added Escanaba shipments to reach the whole.

The total tonnage, net, of the Sault canals for November was 3,274,201 tons, making for the year to December 27,817,811 tons, an increase over the full year of 1900 of 2,300,000 tons.

It is now understood that nothing will come of the reputed deal between the Newport Iron Company and the owners of a lease in Section 36, T. 59, R. 17, where some ore and banded quartzite was found, and this find, much heralded in the local papers, will probably lapse into oblivion.

Though much of the ore to be raised during the winter at the Cleveland Cliffs Lake mine will go to Presque Isle docks for storage, there will be stocked at the mine more than 100,000 tons by the opening of navigation. At the Presque Isle stocking grounds a plant of machinery to handle the ore from the cars and to the dock pockets is being installed, and it is expected that 150,000 tons will be placed there. This plan of loading ore at shaft house pockets and sending it to the docks during the cold weather of a northern winter will be watched with much interest by mining men, and not a few are skeptical of the wisdom of the scheme. The company will ship all winter to their furnaces, handling quite a tonnage of ore in that way. The Cleveland Lake mine is hoisting 2000 tons of ore a day and is handling everything through one shaft. It is mining under the bed of old Lake Angeline, which does not look well; in fact, pumps are continually worked to keep the soft mud and water down, while the roof has to be very carefully handled to prevent the mud from flooding the workings as the stopes below are worked out and the roofs drop down.

On the Menominee range the Oliver Iron Mining Company will sink a deep shaft at the Mansfield mine, intending to go to a depth of 1400 feet. Apparatus sufficient for the work to the bottom will be installed as soon as possible, and the work will be carried on from three points.

Three explorations are under way near Crystal Falls by the Pewabic Iron Company. One of these is south of the Hilltop mine, and a drill will be worked to a considerable depth. Another is about 7 miles from Iron River, near Beechwood, where there is also a heavy surface of hard material. At Saunders is the third exploration and there is a surface of about 300 feet.

The Penn Iron Mining Company will sink their Cyclops shaft to a greater depth and will also sink a new shaft at the Central Vulvan property. Several other shafts will be sunk on the Menominee in the near future.

The shipments of the Michipicoton range (F. H. Clergue) have not been quite as large as expected and will foot up to about 240,000 tons, of which most have gone to Cleveland and the United States. The mine will be worked all winter and prepared for extensive shipments another season.

The big steel barge "John Smeaton" of the Pittsburgh Steamship Company (United States Steel Corporation), went on shore at Au Train, east of Marquette, Lake Superior, some week or two ago. The vessel was light and went on very hard. The rocks of the reef over which she bumped broke through her bottom and made the task of releasing her a serious one. The contract was let to Capt. Jas. Reid, who discarded all previous methods in use on the lakes and undertook to release the ship by pumping the hold full of air, which would, he figured, drive out the water and lift the ship clear. It was impossible to pump the water out directly. He went to work under a contract that is said to have been for a large minority share of the vessel if he succeeded and no payment if he failed, and in three days had floated the ship. The compressed air drove out the water and the ship is now being towed to Duluth for rebuilding. She carried no insurance. It is

expected that not less than 60 steel ships will lie up at Duluth for the winter, many of them belonging to the Pittsburgh Company. There will be more vessels at the head of the lake this winter than ever before, as there is a greater marine interest there than at any point of the lakes aside from Cleveland. D. E. W.

The How and the Why of the Porro Prism Field Glass.*

BY WORCESTER REED WARNER CLEVELAND, OHIO.

Six years ago the writer brought home from Germany a strange new kind of field glass, called the Zeiss

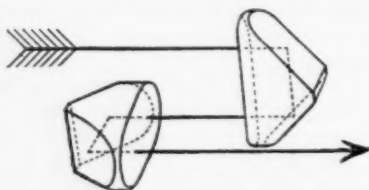


Fig. 1.—Path of Light through Porro Prisms.

path of light rays in the type of terrestrial telescope commonly known as the "spy glass."

The rays of light gathered by the object glass reach their focus at the "focal plane," and back of this is the system of lenses forming the erecting eye piece, from the eye lens of which the pencil of light passes to the eye. In this type, also, the field of view is necessarily so reduced as to make the use of the instrument very unsatisfactory. It must be quite long, too, and therefore very hard to hold steadily.

Our next illustration is the astronomical telescope shown in Fig. 4.

This is the most simple and most perfect of all. As in the other types, the object glass gathers the light

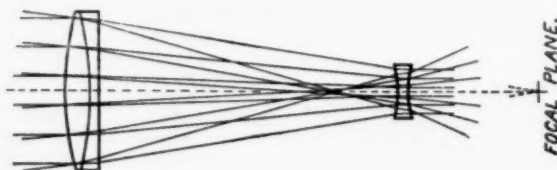


Fig. 2.—Galilean Telescope (Opera Glass).

THE HOW AND WHY OF THE PORRO PRISM FIELD GLASS.

prism binocular, one of the first made, and among the earliest imported into this country. It looked like an eccentric and somewhat unlovely opera glass, and persons casually handling it gasped to hear that it cost \$40. In the meantime, however, the public has grown used to seeing prism binoculars, and hardened, in a way, to their price, realizing that they are instruments of precision, to which all other kinds of field glasses bear about the same relation as that of a cheap watch to a fine chronometer. Each has its place in the world; the costlier is to be accounted a luxury. But what the public has not yet come to wholly understand is the reason why the prism binocular gives its marvelous results. Since these insure its permanency and development beyond all peradventure, a simple analysis of the principles involved becomes an essential part of the average man's education, and is surely not to be overlooked by the engineers forming this society, some of whom, doubtless, own and use the instrument without fully understanding the how and the why of it.

The combination of prisms called by his name was invented about 50 years ago by the French engineer and optician Porro, to whom a patent was granted by Napoleon III. The principle of Porro's invention is illustrated by Fig. 1, where two prisms, each having one 90 degree angle and two 45 degree angles, are shown in their relative positions. A pencil of light or the image of an object passing through them is inverted.

To follow the development of terrestrial telescopes and clearly make comparisons, we must illustrate by diagrams the principles governing the three common types of refracting telescopes, together with the Porro prism telescope.

Fig. 2 shows a sectional view of the instrument known as the Galilean telescope, which is the same thing as our common field or opera glass.

In this telescope the rays of light collected by the object glass are allowed to pass through a system of double concave lenses before reaching the focus, with the result that the converging rays are made divergent as they emerge from the concave eye lens ready to enter the eye. As this divergent cone of rays is necessarily many times larger than the pupil of the eye, but a small part of the field gathered by the objective can be utilized; hence the very small field of view in all telescopes of this type. This limitation necessitates very low magnifying powers, the highest we find being but 6 diameters, while the usual power for Galilean field glasses is but 4 or 5 diameters, and for opera glasses but 2 to 3 diameters, which latter is quite sufficient for ordinary theater use.

Fig. 3 illustrates the arrangement of lenses and the

and sends it down toward the focus at the "focal plane," where it is taken by the simple astronomical eye piece. Thence it emerges in a pencil of light smaller than the pupil of the eye, which, by using the same magnifying power as in the other types mentioned, is enabled to observe a field of view three times the diameter (nine times the area) shown in either of the instruments illustrated in Figs. 2 and 3. But in this instance the object is seen inverted. All astronomical telescopes show the object thus; which is all right for the stars, but will never do for terrestrial observation.

Now, if we could erect the image of the object shown in the astronomical telescope, we should have the finest terrestrial telescope possible. This is just what is done by introducing the Porro prisms. The object is now shown with all the clearness, definition and large field of the astronomical telescope, and in an erect position, and so the pretty problem is solved.

But there are several questions to be asked by the thoughtful man who handles one of these field glasses. We may as well anticipate them and answer them in turn.

Just how do the prisms do their part?

The prisms serve a two-fold purpose, the first and most important being, as has been said, the erection of the object observed, and the second, the shortening of the telescope by twice turning the ray of light upon itself, so that the total length adjusted for use, whether for 6, 8, or 10 power, is but 4 inches, and the total weight, in binocular form, but 13 ounces, so small and light, indeed, that it can easily be carried in the pocket.

Each triple barrel of the prism field glass contains two double reflecting prisms, as shown in the diagram, Fig. 5.

The rays of light passing through the object glass enter the first prism in such a way as to be twice totally reflected, each time at an angle of 90 degrees, thus emerging parallel to the entering ray, but in the opposite direction. It is then caught by the second prism, and is similarly reflected and sent on its course toward the eye piece, in its original direction, without change, except in one very important particular—viz., the image of the object observed, which without the intervention of the prisms would be upside down, is now erect, and is ready to be magnified by the simple astronomical eye piece, just as the stars and planets are magnified in the largest telescopes.

Why is the focal adjustment so perfect?

The depth of focus, so called, is always in direct ratio of the focal length of the object glass to its aperture. This ratio in the best Porro prism field glasses is not less than 6, while in the best opera glasses, or in the old type of field glasses, it varies from 2 to 3. These latter are, therefore, at least twice as sensitive to focal adjustment as are the Porro prism field glasses,

* Paper presented at the New York meeting of the American Society of Mechanical Engineers.

which beyond 100 feet are practically of universal focus.

But why is the object so clearly and sharply defined?

The prisms allow nearly all the light that enters the object glass to pass to the eyes, only about 10 per cent. being lost by passing through the lenses and prisms. The light efficiency is accordingly about 90 per cent., a proportion more than double that possible in either of the old forms of field glasses.

Finally, how can the field be so surprisingly large here, or why is the field shown by the old time glasses so small? Let us try and get a correct comparison of the two types of telescope.

When observing with the Galilean telescope (opera glass type) the rays of light are divergent as they enter

most advantageously used range from 6 to 10 diameters. It is true that no one power is best for all purposes. A good average, however, is reached in the 6 and the 8 powers, which are those in most popular use. The uninitiated often make the mistake of thinking that the highest powers are most desirable, which is far from the fact. Any increase in power must be met by a decrease in field of view, by a diminution of light, and also by an increase in the effect of unsteadiness of the instrument while observing. The Porro prism glasses are so short that they can be better held than any other kind of terrestrial telescope, and therefore there is no practical difficulty in holding an 8 power with sufficient steadiness to make terrestrial observation suc-



Fig. 3.—Terrestrial Telescope (Spy Glass).

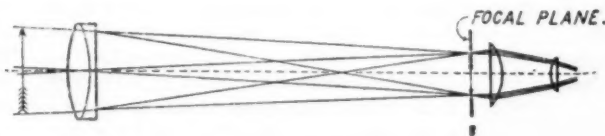


Fig. 4.—Astronomical Telescope.

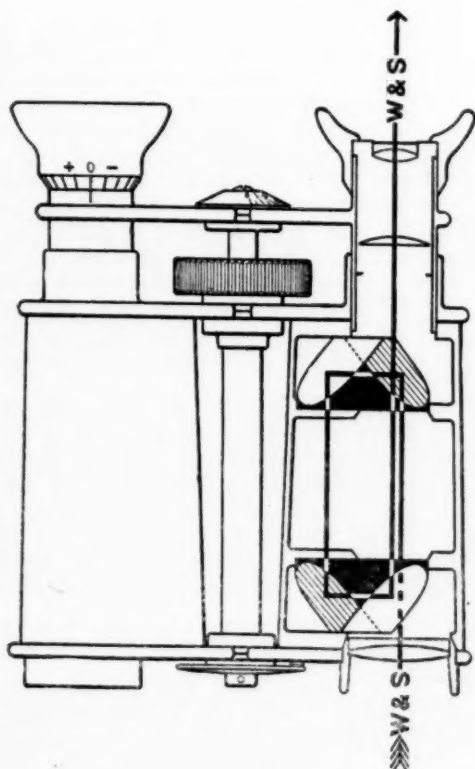


Fig. 5.—Section of Warner & Swasey Universal Prism Field Glass.

THE HOW AND WHY OF THE PORRO PRISM FIELD GLASS.

the eye, and the field of view can be moved over an extended area by moving the eye about the eye lens of the instrument, just as when looking through a conical roll of paper from the larger end. The size of the field must always be small, as in the case of the paper cone, and is limited by the diameter of the object glass, precisely as the hole in the small end of the paper cone limits the field of view shown when looking into the larger end.

The Porro prism field glass is constructed on exactly the opposite principle. The rays of light are convergent as they enter the eye, as in looking through the paper cone from the small end, giving a large and uninterrupted field, three times the diameter (nine times the area) that is possible in the old instrument of the same power, the field of view being governed by the astronomical eye piece, instead of by the size of the object glass.

In the development of the prism binocular it has been found that the magnifying powers which may be

successful. Any higher power than this is apt to cause annoyance from the reasons mentioned, while the 6 power (which is as high as any of the old style Galilean field glasses) is eminently satisfactory for natural history and general landscape observations; and the fact that its field is three times as large as is possible in the Galilean telescope of the same power is enormously in its favor.

A few minutes' practice will enable one to quickly determine the power of any opera or field glass. Place the left eye piece to the right eye, closing the left eye meanwhile, and carefully focus on a near object, preferably a window across the street. With this object clearly in view, open the left eye, when two images of the window will be evident—one magnified by the instrument and the other as seen by the unaided left eye. An instant's comparison will show how many times longer and wider is the image shown by the telescope than the one viewed by the unaided eye. This ratio represents the power of the field glass in diameters.

The magnifying power of the two field glasses can readily be compared by observing an object with both at the same time, using one eye for each of the glasses tested.

The many special advantages possessed by the Porro prism field glass early attracted the attention of Government officials throughout the world, and after searching investigation and severe tests, these instruments have been very generally adopted for Government use. During the last year Germany ordered over 6000 of them, while England has sent as many or more to South Africa; and in the various departments of our own Government they have become very popular and are rapidly taking the place of all other field glasses. The fact that they give greater power and field, with better definition, and at the same time are but a fraction of the size of the old Galilean type, is a sufficient explanation of their popularity for army and navy use.

Why Adoption was Delayed.

In view of the great advantages possessed by these instruments over all other terrestrial telescopes, why, you will ask, did the invention wait a half century before practical use was made of it? There are at least two adequate reasons:

1. The best optical glass manufactured at that time absorbed so much light as to render impracticable the successful use of Porro prisms made of it.

2. Opticians have only within recent years known how to make absolutely flat surfaces, without which the object seen through the Porro prism telescope is distorted.

Both difficulties have been brilliantly conquered. The borosilicate glass made by Mantoux of Paris and Schott of Jena, and which is exclusively used for these prisms, is so nearly perfect that but 4 per cent. of light passing through it is lost by absorption. Moreover,

optically flat surfaces are now made correct within a limit of less than one-tenth of a wave length of light (meaning, in linear measure, less than 1-500,000 inch), and it is a proper source of pride to us all that our own honored fellow member of this society, John A. Brashear, is the founder and head of the works which lead the world in this class of production. The spectro-scope prisms made in his laboratory are in use in the leading observatories of the world and have never been equaled, while the Porro prisms, which he manufactures by the thousands, are the most perfect ever made.

The credit for first applying the principle practically in bringing out a successful Porro prism field glass must be given to Dr. Abbe of Jena, the able leader and manager of the famous Zeiss works, which have done so much in perfecting optical instruments. This was in 1895. The American makers of this instrument, the Bausch & Lomb Optical Company, have recently improved it by adopting a universal focal adjustment. The two triple tubes are hinged so as to allow adjustment between the eye pieces to suit the pupillary distance of the eyes of the observer. The hinge so connects the tubes as to place the objectives about an inch apart wider than the eyes, which feature has been alleged to impart a stereoscopic effect. As a matter of fact, the clearness and the sharpness of definition in these instruments were so far in advance of what had been previously obtained that the improvement was mistakenly attributed to the greater width between the objectives. This belief is still held by some persons who have not investigated the claim.

A short time after the introduction of the Zeiss glass came the Goerz binocular. This is also made in Germany. The pupillary distance is adjusted by parallel slides actuated by racks and pinions. A similar movement also gives universal focal adjustment. The present design of this instrument is the same as when first put on the market five or six years ago.

As an evidence of the development of manufacturing in the United States, it may be added that the highest quality of Porro prism field glasses are made here and sold at the same prices that are charged for similar instruments in London, Paris and Berlin, the American interchangeable system of manufacturing counteracting the effect of European cheap labor.

So, then, for soldier and sailor, sportsman and scientist, tourist and—engineer, let us say—these admirable instruments are being turned out in ever increasing numbers, and there is no limit yet apparent to the demand; for, be it remembered, the luxuries of to-day are the necessities of to-morrow.

Pittsburgh as a Freight Center.—No more significant showing of the importance of Pittsburgh in freight organization could be made than that given by the report of the National Association of Car Service Managers for the quarter ending September 3, 1901. At the same time the report indicates the widespread prosperity of the country. In the quarter ending with September there were reported at Pittsburgh 448,665 cars, or nearly one-tenth of the total cars reaching the 35 associations reporting. The only other district even approximating these figures is covered by the New England Association, which reports 439,795 cars. Philadelphia is third with 394,381, while Chicago is fourth with 356,077. The total for the quarter for all cars reported by all associations is 4,908,304. As compared with the report for the same quarter of 1900, Pittsburgh's cars have increased from 408,235 to 448,655, 10 per cent. For the whole territory the growth has been from 4,309,774 to 4,908,304, an increase of 598,530 cars.

A slight misunderstanding has occurred between the iron workers belonging to the Amalgamated Association and the manufacturers in the Youngstown, Ohio, district, over that portion of the Amalgamated scale pertaining to the working of steel billets. However, the trouble is not serious, and will probably be adjusted at a conference to be held this week between an official of the Amalgamated Association and James H. Nutt, labor commissioner of the Republic Iron & Steel Company.

Central Pennsylvania News.

HARRISBURG, PA., December 9, 1901.—The situation here is very satisfactory to the companies operating the establishments in the vicinity of this city. All of the mills have been running regularly, and there have been a number of orders booked by the concerns which bid fair to keep the wheels humming until the winter is over. Big shipments have been made from all of the works in this city, and at Steelton they have been limited by the car supply. A careful estimate shows that more men are at work in this section's mills than ever before.

Reports from Chester are that an option has been taken on 76 acres of land along the Darby Creek by parties interested in a new tube mill, which may be moved from Newcastle, Del. It is said that the negotiations will be closed before long and work started early in the new year. The American Steel Casting Company of Chester have completed some additions to their open hearth department, and last week made several huge castings for the steamer "New York," including a large rudder. The pouring of these immense castings was very successful.

From Lebanon comes news of more activity. The American Iron & Steel Mfg. Company have announced that they will remove to Lebanon the National Bolt & Nut Works of Reading, lately known as the North Reading plant of the company. This plant and site have been sold, and the machinery and buildings will be removed to Lebanon before February. The new works will handle the rivet business of the company. At Lebanon the Lackawanna Iron & Steel Company have bought 40 acres close to their Colebrook furnaces, and will build some additional buildings. Then there is also a report that the Pennsylvania Steel Company will build additions to their Lebanon furnaces. The Lebanon Chain Works is adding new machinery and furnaces to handle heavier chains.

The old Pennock Rolling Mills, at Coatesville, also known as the Valley Mills, are to be started by a company to be styled the Coatesville Iron & Steel Company, who will be incorporated this month. The mills have been idle for years, but part of them will be rebuilt, so that at least 500 men will be given employment. The company will be composed of Henry K., W. W. and W. B. Kurtz, William Drost and Elwood Porter of Philadelphia.

The Renovo Car Works are so busy that men are employed on night shifts.

York Iron Works are humming with foreign orders. The York Mfg. Company have among their recent orders one for ice machines for Cuba and other tropical countries. The A. B. Farquhar Company have sent plows to Chili, and Baugher, Kurtz & Co. have been sending car castings to Cuban ports. The Norway Iron & Steel Company have also been doing considerable foreign work. All of these concerns have other foreign work to fill.

There was a strike of a brief duration at the works of the Logan Iron & Steel Company, at Burnham, near Lewistown. It was caused by the employment of a negro foreman.

Every works in Reading made full time in November.

The Harrisburg Foundry & Machine Works have been notified of the successful installation and starting of the engines they built for the light and power plant of the Charleston Exposition. The works has also received the order to build the power plant of the Farrel Works, at Ansonia, Conn.

A Steel Casting Record.—Furnace No. 2 of the Solid Steel Casting Company, Chester, Pa., has just completed one of the most remarkable runs in the history of the steel casting industry. This furnace has made 490 consecutive heats without any stoppage for repairs. During this campaign some 12,250,000 pounds of steel castings were made. Considering the delays which are attendant on a furnace of a steel casting plant, this performance is somewhat phenomenal. The furnace is of Herrick design, 15 tons capacity, and supplied with two improved gas producers.

Philadelphia Foundrymen's Association.

The one hundred and thirteenth regular meeting of the Philadelphia Foundrymen's Association was held at the Manufacturers' Club in that city, Wednesday evening, December 4, 1900. The meeting was called to order at the usual hour, the president, Thomas I. Rankin, occupying the chair. Among those present may be mentioned:

Thos. I. Rankin, Abram Cox Stove Company, Philadelphia.
 Jas. S. Stirling, Harlan & Hollingsworth, Wilmington.
 Thos. Devlin, Thos. Devlin & Co., Philadelphia.
 P. D. Wanner, Reading Foundry Company, Reading, Pa.
 A. C. Mott, Abram Cox Stove Company, Philadelphia.
 Thos. Green, Wilbraham-Green Blower Company, Philadelphia.
 J. Hy. Julian, J. W. Paxson Company, Philadelphia.
 L. R. Lemoine, United States Cast Iron Pipe & Foundry Company, Philadelphia.
 R. C. Oliphant, Trenton Malleable Iron Company, Trenton, N. J.
 Thos. Hobson and A. A. Miller, *The Iron Age*, Philadelphia.
 H. B. Taylor, Pettinos Bros., Bethlehem, Pa.
 Guyon Miller, Downingtown Mfg. Company, E. Downingtown.
 W. J. W. Moore, Pilling & Crane, Philadelphia.
 Jas. T. Strain and John T. Dickson, Robt. Wetherill & Co., Chester, Pa.
 C. H. Newcomb, Matthew Addy & Co., Philadelphia.
 John Smith and J. Burns, Midvale Steel Company, Philadelphia.
 S. Decatur Smith, "Foundry," Philadelphia.
 H. O. Evans, Thos. Devlin & Co., Philadelphia.
 Geo. C. Davies, Pilling & Crane, Philadelphia.
 Jas. L. Keightley, Geo. V. Cresson Company, Philadelphia.
 Oregon J. Ward, Howe Scale Company, Philadelphia.
 C. D. Matthews, Camden Iron Works, Camden, N. J.
 Paul C. Vanleet and Benj. Booze, I. A. Sheppard & Co., Philadelphia.
 D. G. Moore, Sam'l L. Moore & Sons, Elizabethport.
 A. J. Wright, Abram Cox Stove Company, Philadelphia.
 Geo. W. Moore, Reading, Pa.
 Walter S. Stevenson, Thomas, Roberts, Stevenson Company, Philadelphia.
 Howard Evans, J. W. Paxson Company, Philadelphia.

The reading of the minutes of the preceding meeting was dispensed with in the usual manner. The report of the treasurer was read, showing a balance on hand of \$1664.83, with all indebtedness paid. The Executive Committee reported favorable progress on the matter of incorporation of the association. The question of obtaining same under the laws of Pennsylvania or those of Delaware was discussed, and the matter referred back to the committee for further action.

J. S. Stirling, a member of the committee representing the Foundrymen's Association of Philadelphia at the National Reciprocity Convention, held in Washington, D. C., November 19, 1901, made the following remarks in reference to the convention: "The general attitude and results of the National Reciprocity Convention are no doubt familiar to you all. The attendance was representative from the New England, Middle, Southern and Western States, and the discussion was animated, the main points brought out being the recommendation to Congress for a department of Commerce and Industries, to take up this important question, and that the chief of the department be made a member of the President's Cabinet. There was no desire for tariff tinkering, or any means that would disturb the general business conditions, but that unless something was done there would probably develop a condition when the countries to whom we sell our products would ultimately close their doors to us. Protectionists," Mr. Stirling said, "were out in force and favored reciprocity in all cases where it did not conflict with goods manufactured in this country."

The application of H. C. Haldeman, Pulaski Iron Company, 338 Walnut street, Philadelphia, for membership in the association was read, and, on motion, the secretary was instructed to cast the favorable ballot for membership.

A communication from the McKinley National Memorial Association, asking for contributions for their fund, was read, and a motion was made that \$100 be contributed. After discussion an amendment to the motion making the amount \$50 was offered and accepted, and on a vote of the association the amendment was adopted.

The paper of the evening was then announced, on

Combustion and Its Effect on the Structure of Both Fuel and Metal,

by J. G. Sadlier of the Springfield Foundry Company, Springfield, Ill., also president of the American Foundrymen's Association. He reaches the following conclusions:

"1. That the same mixture of iron, melted under the different atmospheric and heat conditions which may prevail at the time, will not produce the same grade of iron in the castings; 2, melted iron poured into a large ladle where it may become thoroughly mixed, will not produce the same grade of castings, if poured against a chill, in a small section or in a large section. In the first case the absorption of gases will vary, and the constituency of the melted mass is variable. In the second, the sudden chilling locks up all the occluded gases in the small sections, while allowing most of them to escape in the larger, slower cooling ones. The consequence will be the formation of the gas pockets above mentioned. Melted iron coming in contact with anything which would cause agitation, such as moisture from overly damp sand, or the pouring into hard molds, shows the same characteristics."

"The conclusion therefore is that to obtain a certain character of iron in a casting reliance must not be placed entirely upon the nature of the iron charged into the cupola; but the atmospheric conditions, coke, blast and character of casting to be made are also important factors; a most important one being the getting of a proper combustion."

Considerable discussion followed on the points of the paper, in which Thos. Devlin, D. G. Moore, H. O. Evans, and others took part, at the conclusion of which Mr. Moore moved that a vote of thanks be tendered Mr. Sadlier for his paper, which was adopted.

The secretary then announced that at the January meeting of the association there would be practical demonstrations of both core making and molding machines, and that these would be of particular interest to all foundrymen, after which, on motion, the meeting adjourned.

Luncheon followed as usual. James S. Stirling, acting as toastmaster, called in turn upon T. I. Rankin, P. D. Wanner, O. J. Ward, L. R. Lemoine and A. J. Wright, each responding in an entertaining manner, after which the social session came to a close.

The New Ship Subsidy Bill.

Senator Frye has introduced the new Ship Subsidy bill. It differs in form from the subsidy bill of the past two sessions, and is divided into four titles and 15 sections.

The sections under the title "Ocean Mail Steamships," are devoted to amendments to the Ocean Mail act of 1891. The Postmaster-General is required to consider the national defense and the maritime interests of the United States, as well as postal interests in providing for the transportation of American ocean mails.

The present limit of ocean mail contracts, ten years, is increased to 15 years. The Frye bill provides seven distinct classes, with a rate of \$6 to 20-knot steamers, increasing the minimum size from 8000 to 10,000 tons; \$3 for 16-knot steamers, provided the size is increased from 5000 tons, the present minimum, to 8000 tons. The proposed maximum mail rates per gross ton per 100 nautical miles are: Over 10,000 tons, 20 knots, 2.7 cents; 19 knots, 2.5 cents; over 5000 tons, 18 knots, 2.3 cents; 17 knots, 2.1 cents; 16 knots, 1.9 cents; 15 knots, 1.7 cents; over 2000 tons, 14 knots, 1.5 cents.

Rates of mail steamers to the West Indies, Central America and Mexico cannot exceed 70 per cent. of the maximum rates.

The second title, "General Subsidy," contains the general subsidy for all vessels, steam or sail, which are not under mail contracts. This general subsidy is uniform, 1 cent per gross ton per 100 nautical miles for not exceeding 16 entries in one year.

To promote the building of new ocean vessels an additional allowance of $\frac{1}{4}$ cent per gross ton is made for five years.

Any vessel to receive the general subsidy must carry mails if required, and must train in seamanship or en-

gineering one American youth for each 1000 tons, the vessel to be at the service of the Government if required for defense.

Any vessel to receive subsidy must be Class A1, and at least one-fourth of the crew must be Americans.

The bill provides an annual bounty of \$2 a ton for deep sea fishing vessels and of \$1 a month for American citizens when engaged in deep sea fisheries; that a vessel shall receive only one form of subsidy, and that a vessel which has received a subsidy shall not be sold to a foreigner, except by consent of the Secretary of the Treasury.

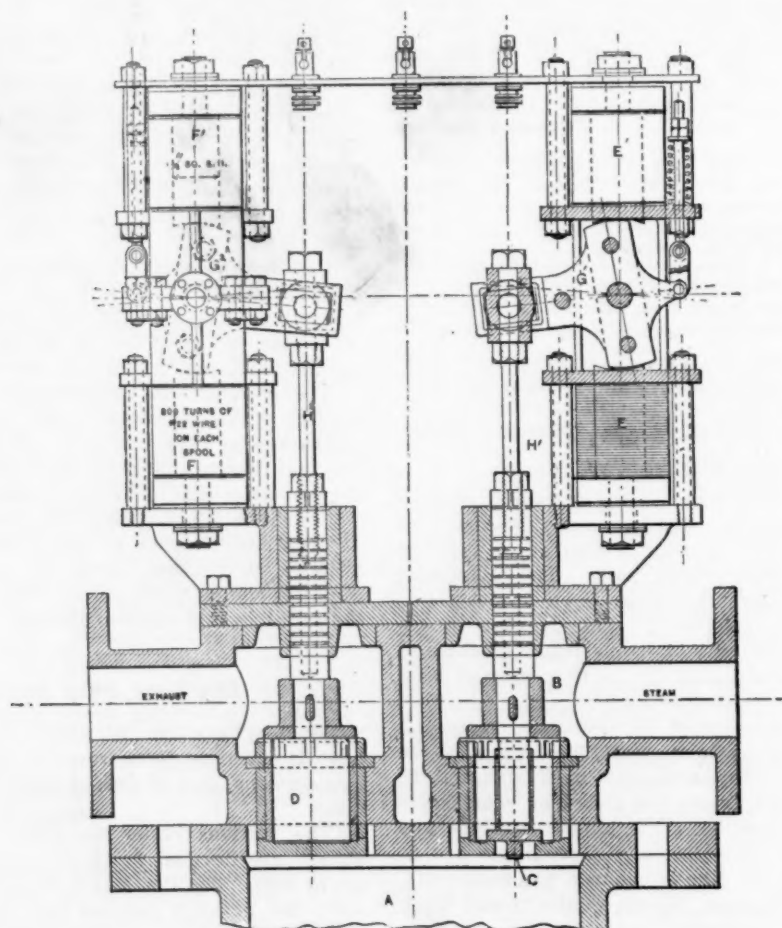
The bill does not provide American registry for foreign ships owned by Americans.

The Washington Coal & Coke Company.—The Washington Coal & Coke Company of Dawson, Pa., N.

A New Valve Gear for Gas, Steam, and Air Engines.*

BY ERNEST W. NAYLOR, PHILADELPHIA, PA.

1. So far as sharp cut off, expansion, exhaust and compression were concerned, the early engines with hand actuated valve gear were better than any engine with valve gear actuated by mechanical means at the present day; but the speed being limited by the endurance of man, necessity for continuous work and more speed brought into use mechanically actuated valves more or less perfect. High steam pressures made it necessary to compound the cylinders in order to get the most possible out of steam; but even with the vast improvements made in recent years the engine is still limited in speed by its valve gear; expansion and com-



Valve Gear.

NEW VALVE GEAR FOR GAS, STEAM AND AIR ENGINES.

1. Hyndman, general sales agent, Cuyahoga Building, Pittsburgh, have closed a contract with the United States Gas & Coke Company, operating by-product coke ovens at Glassport, Pa., for their entire supply of coal for next year, to be used in making by-product coke. The Washington Coal & Coke Company have had this contract for some years and their coal has given such satisfaction that the contract has again been renewed for next year. The Washington Coal & Coke Company have placed a contract with the Barney & Smith Car Mfg. Company of Dayton, Ohio, for 100 30-ton coal cars.

Considerable interest has been aroused in Chicago iron circles by the publication of authority to organize the American Rolling Mills Corporation with a capital of \$1,000,000. The names of the promoters of the company have not been disclosed. It is believed that the corporation will be an enlargement of some existing undertakings.

pression are also limited in single cylinder engines to a considerable degree, and while we get increased economy by compounding, the extra cost of the engine is a serious item to many users, and they prefer to buy a cheaper engine and use more coal.

2. The writer has for many years made this question a special study, and, in presenting this paper before the society, thinks he can show marked economy from the use of the valve gear here described, a gear whereby perfect expansion and compression can be obtained in simple engines using pressures up to 200 pounds per square inch, having a range of cut off from 0 to 100 per cent. of the stroke, and the same range in exhaust and compression, giving ability to stop or reverse from any part of the building or engine room without shutting off steam. This gear will also admit steam many times during the same stroke, and ability to stop in a very

* Paper presented at the New York meeting of the American Society of Mechanical Engineers.

short space of time without shock or jar is another advantage, while the speed is only limited by the possible piston speed.

The engine that has been under test for 12 months is small, but the results are certainly remarkable. It was calculated for a 5 horse-power single acting three-cylinder engine with 150 pounds per square inch boiler pressure, and to run at 500 revolutions per minute, and has been run at varying pressures from 1 to 60 pounds

one-twenty-fifth the area of the cylinder in each case. Table No. 1 gives a few results out of the many tests we have made. The engine has run 30,000,000 revolutions up to the date of writing this paper (September, 1901) and not a single bushing has been taken up or valve refaced. There are no glands, so that no packing has been used, and no piston rings were used, the pistons being very deep and grooved. The cylinders were well covered, but pipes, valve bodies and boiler were

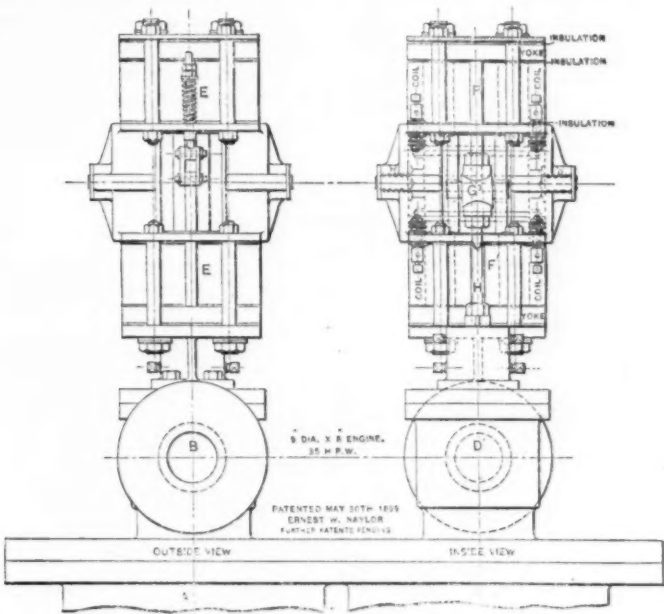


Fig. 2.—Elevation and Section.

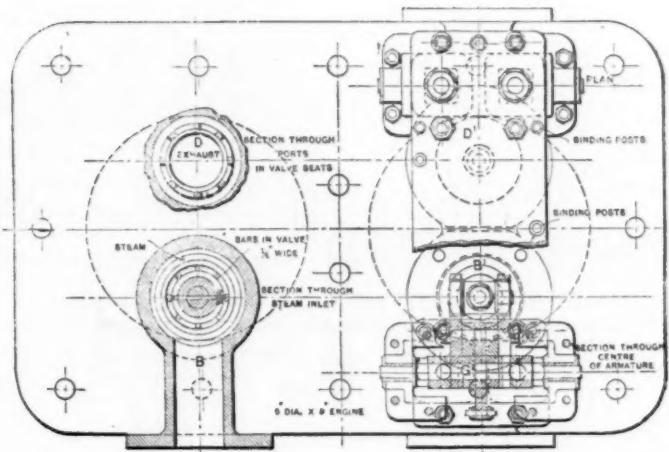


Fig. 3.—Plan.

NEW VALVE GEAR FOR GAS, STEAM AND AIR ENGINES.

per square inch; it was not possible to reach a higher pressure where the tests have been conducted. The engine has also been successfully run with compressed air.

uncovered; under these conditions the exhaust was very even when using a high rate of cut off, as the table shows:

Table I.							
Number of test.....	1	5	20	28	50	60	60 A
Load	None.	None.	None.	None.	2 horse-power.	3 horse-power.	None.
Lead	1 per cent.	2 per cent.	2 per cent.	2 per cent.	3 per cent.	3 per cent.	2 per cent.
Cut off at per cent. of stroke.....	50 per cent.	15 per cent.	10 per cent.	8 per cent.	3 per cent.	2 per cent.	Dead center.
Exhaust open at per cent. of stroke....	85 per cent.	85 per cent.	85 per cent.	90 per cent.	85 per cent.	80 per cent.	85 per cent.
Exhaust closed at per cent. of stroke..	50 per cent.	20 per cent.	15 per cent.	20 per cent.	15 per cent.	10 per cent.	Dead center.
Area of steam valve opening.....	1-125	1-125	1-125	1-125	1-125	1-125	1-125
Area of exhaust valve opening.....	1-60	1-60	1-60	1-60	1-60	1-60	1-60
Steam pressure in pounds per square inch	1	5	20	28	50	70	70
Revolutions per minute.....	60	300	440	600	540	680	875

3. The cylinders are 2½ inches diameter by 4 inches stroke; the clearance is 1 per cent. of the cylinder capacity. Poppet valves placed in the heads are used both for steam and exhaust, the maximum opening being

4. Figs. 1, 2, 3, 4, 5 and 6 show the gear as applied to two Westinghouse engines, one being 9 x 8 inches, and the other compound, 8 and 13 inches by 8 inches. These engines have not been tested at the date of writing, but

the design being the result of the tests on the engine used, it is thought better to use them as an illustration of the working of the gear.

The lettering refers to the parts, as follows:

A A', cylinders; B B', steam valves; C C' relief valves in steam valves; D D', exhaust valves; E E', electromagnets controlling steam valves; F F' electric magnets controlling exhaust valves; G to G', armatures and levers connected to valve spindles, the travel of which is adjustable for a range from 0 to maximum by bolts and nuts, H to H'.

I and J are contact disk controllers, which control the time of opening of the steam and exhaust valves and the point of stroke of the piston at which the valves are closed, or, in other words, the lap, the lead, exhaust opening and closing, expansion and compression.

and low pressure cylinders and the points of exhaust opening.

5. The disks R R' are merely to carry the binding screws for the wiring to the several magnets, and to keep electrical connection whenever the levers M M' are turned.

The levers S S' are keyed to the sleeves s s', which connect by links and levers to the contact levers K K' and L L', the levers S S' being also connected to the governors T T', which respectively control the steam and exhaust valves. In marine, automobile and locomotive engines the governors are dispensed with and starting levers used instead.

The range of the levers K K' and L L' being u to U, it will be seen that valves may be held open from 0 to 100 per cent. of the stroke or to any intermediate posi-

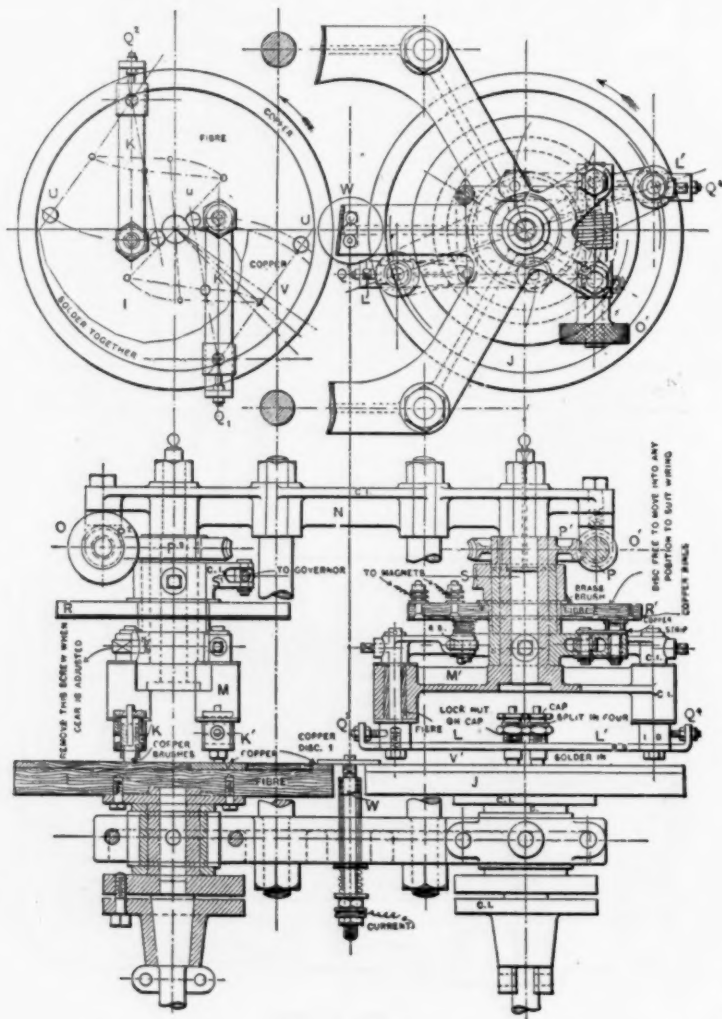


Fig. 4.—Details.

NEW VALVE GEAR FOR GAS, STEAM AND AIR ENGINES.

K K' are adjustable levers carrying brushes, or contact points, to make electrical connection between the sickle shaped contact plates and the magnets controlling the steam valves; L L' are levers for exhaust valves similar in all respects to K K'.

M M' are lever arms carrying the contact levers K K' and L L'. The bosses or hubs of these levers are extended up to the bracket N, which carries all of the adjustments and contact levers. The contact levers K K' and L L' can be placed in any position in relation to the position of the cranks by turning the hand wheels O O', which actuate the worms and worm wheels P to P', the wheels being keyed to the hubs of M M', so that either positive or negative lead may be given the steam valves while the engine is running; in a similar manner the time of opening of the exhaust valves in relation to the position of the piston may be adjusted. The adjusting nuts Q' to Q' are used to vary the relative leads of high

tion, according to the length of time contact is made with the plates V V', the current being passed to these plates through the connection W, which is connected to one electrode, the other ends of the magnet coils all being connected to the other electrode, as shown in Fig. 6. From the above it will be seen that the valves may instantly open and close, and steam be given many times during the same stroke.

6. All eccentrics, rods, levers, links and other usual valve gear being done away with, the new valves and valve gear are placed on the heads, so that erection is easy. Clearance can be gotten down to one-tenth of 1 per cent. in large cylinders, being only 1 per cent. in a 2½ x 4 inch cylinder, as previously mentioned; therefore compression up to initial pressure is easily obtained without any appreciable loss of efficiency. The valve gear may be placed in any position most suitable to the design of the engine, regardless of the position of the

crank shaft; the friction of the gear is a negligible quantity and adjustments may be made while the engine is running. During the tests a piece of newspaper placed

running at full speed and without the use of a governor. The larger the engine the smaller the relative cost and size of the gear, the drawings here shown being amply large for one of 500 horse-power. There was no vibration; when a glass of water was placed on the cylinder head and the engine stopped at once not the slightest disturbance of the water was evident.

8. It will be readily seen that when using compressed air as a driving power the economy is very much greater than with any other valve gear, and it is possible, when motors are to be used in various scattered buildings, that air can be used much more economically than steam, owing to the absence of condensation in transmission and the high rate of expansion obtainable.

9. In the case of gas engines the best burning or explosive mixture is readily obtainable, as the proportion of air to gas can be at once adjusted; likewise the cut off is adjustable, therefore any amount of mixture can be admitted to the cylinders, thus making regulation easy of accomplishment; the exhaust is also adjustable from 0 to 100 per cent.

The New Haven Iron & Steel Company.—For some time past reports have been current that a movement is on foot looking to the purchase of the New Haven Iron and Steel Company of New Haven, Conn., by the Susquehanna Iron & Steel Company. There is nothing whatever to justify these reports. The New Haven Iron & Steel Company are in no way connected with the Susquehanna Iron & Steel Company, either directly or indirectly. The management is entirely different, their way of doing business is by no means the same, and there is nothing in common whatever between the two companies. We understand that the New Haven Iron & Steel Company, whose stock is very closely held, since the controlling interest lies with Christian C. Kaufman, Kennedy Crossan and two other gentlemen, has been

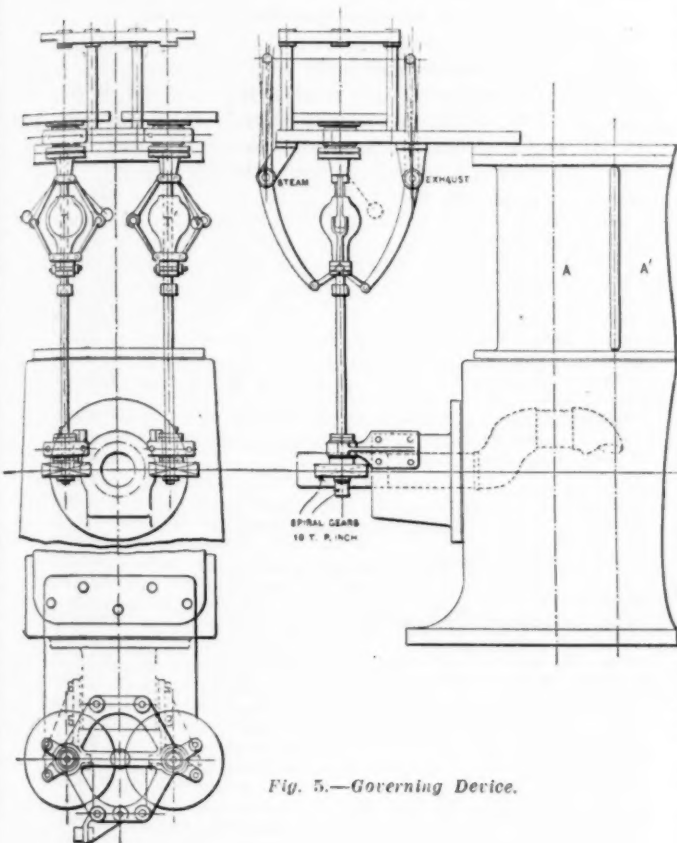


Fig. 5.—Governing Device.

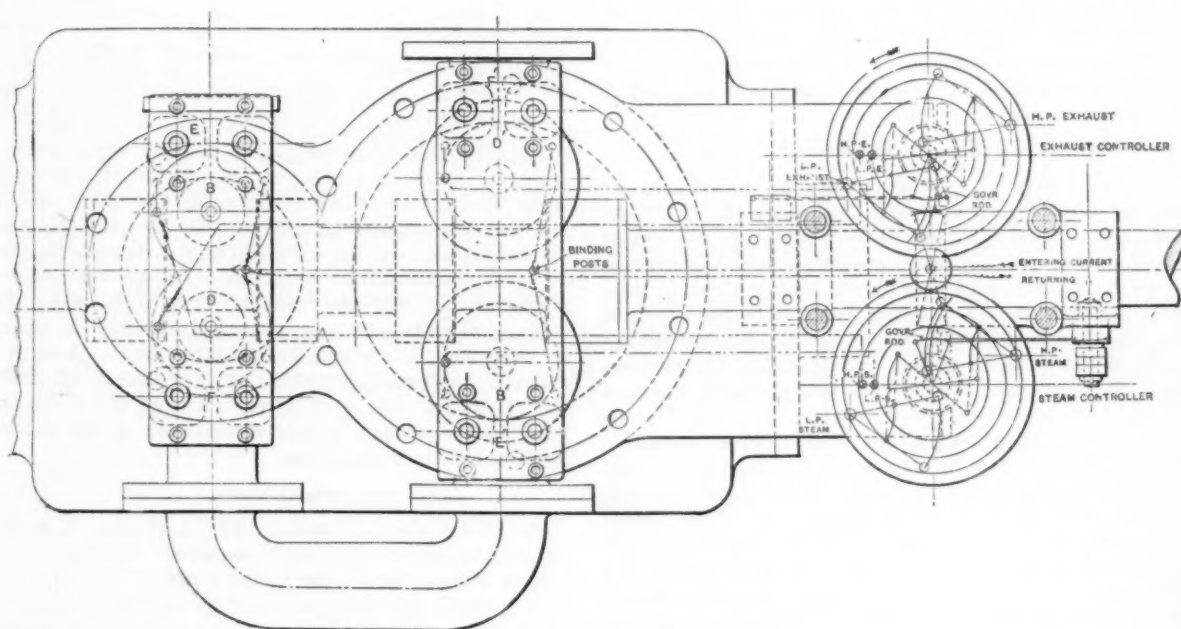


Fig. 6.—Plan.

NEW VALVE GEAR FOR GAS, STEAM AND AIR ENGINES.

between the armature and poles of the magnets (reciprocating magnets were used in this test) made a difference of from 75 to 100 revolutions per minute.

7. The valves are all $\frac{1}{2}$ -inch diameter, and, as shown in the table, the lifts were for the steam valve 2-100 inch and for the exhaust valves 4-100. The exhaust could not be heard 2 yards away and had not enough energy to blow the ash off a cigar. Cylinder condensation was practically nil. No particular care was taken in the manufacture of the engine, but if properly adjusted for the load it was impossible to make it "run away," though the load was suddenly taken off when

offered \$500,000 in cash and \$500,000 in stock for the property. This offer was refused.

The Parkersburg Iron & Steel Company of Parkersburg, W. Va., with offices in the Times Building, Pittsburgh, Pa., have placed four sheet mills in operation, and will start two other mills as soon as completed. The officials of the company are considering the installation of several knobbling fires and puddling furnaces, whereby they will be enabled to manufacture puddled iron sheets and charcoal iron sheets in addition to fine steel sheets.

Canadian News.

Iron and Steel Bounties.

TORONTO, December 7, 1901.—W. G. Parmelee, Deputy Minister of Trade and Commerce, and J. Lorne McDougall, Auditor-General, went to Sydney, N. S., a few days ago in connection with the payment of bounty upon the output of the Dominion Iron & Steel Company's works. In addition to the bounty of \$2 and \$3 per ton on the large quantity of pig iron produced at Sydney there will be a further bounty to be paid on the steel output of the open hearth furnaces. The first fires in two of these furnaces were lighted on the 2d inst. In a week more at the utmost the work of manufacturing steel will be begun. J. H. Lefevre, formerly with the Illinois Steel Company, has been engaged as superintendent, and Hugo Carlson will be placed in charge of the open hearths.

Since July 1 the payment of the bounties on iron and steel has been under the control of the Department of Trade and Commerce, and regulations were authorized by the Minister, Sir Richard Cartwright, to insure against overpayment upon the product of the furnaces. These regulations provide for a sworn statement to be made by the manager of each establishment as to the output upon which bounty is claimed, and as to the proportion of Canadian or foreign ore entering into its production, the bonus being \$3 per ton for the proportion of the iron made from Canadian ore and \$2 per ton for that made from foreign ore. As an additional safeguard the customs officer at each center of production is empowered to examine the books of the company and check the figures of production at the furnaces. The Auditor-General appears to think, however, that still further precautions are desirable, and it is partly to institute these that the present visit is being made to Sydney. As all payments have to go through the Auditor-General's office, and as iron and steel bounties now run into quite a large annual total, the Government is becoming more particular. It is estimated that three-quarters of a million dollars will be paid out in bounties during the current fiscal year.

To Tax Exports of Newfoundland Ore.

The advocates of an export duty on Newfoundland iron ore are stirring up quite an interest in the question. The proposal is received with a certain amount of favor. It is energetically promoted by the *Evening Herald* of St. Johns, a newspaper which strongly supports the present Government, which it helped to elect. The idea has been combatted in the *St. Johns News* by C. E. Willis, who is largely interested in the mineral lands of the colony. He declares that probably the first result of an export tax of 20 cents a ton would be to shut down instantly both of the large iron ore works at Bell Island and deprive the several hundred men engaged there of their employment. Many persons in the country have, he says, an erroneous idea of the value of the deposits, and an impost of 20 cents a ton, he maintains, would not only eat up the entire profit, but place the companies in debt for every ton of ore raised. The *Evening Herald* rejoins with a quotation from the prospectus of the Nova Scotia Steel & Coal Company, showing that the company make a profit of 70 cents on every ton of ore shipped from their Newfoundland mines. To Mr. Willis' further contention that an export duty of 20 cents a ton on Newfoundland ore would drive the Dominion Iron & Steel Company and the Nova Scotia Steel & Coal Company to Cuba for their ore supply, the *Evening Herald* replies with the following quotation from the latter company's prospectus:

"The company have sold for delivery during the present year about 300,000 tons of their iron ore, of which 60,000 tons were sold for delivery in Philadelphia and about 240,000 tons in Germany and Scotland, and the company have already sold for delivery in Germany 160,000 tons in 1902 and 120,000 tons in each of the years 1903-4-5, all at prices which should yield a satisfactory profit to the company."

Also the *Evening Herald* refers to the statements made

by Mr. Moxham, vice-president and general manager of the Dominion Iron & Steel Company, to sustain its view that the ore can stand the tax.

Imports of Agricultural Implements.

In the fiscal year ending with last June Canada imported of implements and other iron and steel articles used by farmers more than it exported. Nearly all the imports came from the United States, while the bulk of the exports went to Australia, South America, &c. The following is a list of the main articles imported:

Binding attachments.....	\$31,081
Cultivators	16,088
Drills	31,092
Farm and road rollers.....	2,049
Forks	4,548
Harrows	47,862
Harvesters	828,118
Hay tedders.....	8,839
Hoes	3,013
Horse rakes.....	104,075
Hay knives.....	174
Lawn mowers.....	5,367
Manure spreaders.....	5,101
Mowing machines.....	426,084
Plows	147,485
Postholders	197
Rakes	1,585
Reapers	57,681
Scythes, snaths, sickles.....	10,551
Spades	21,130
Weeders	457
Other agricultural implements.....	132,193
Carts and wagon skelns.....	3,705
Horse and ox and mule shoes.....	11,709
Fanning mills.....	2,184
Grain crushers.....	482
Wind mills.....	20,583
Feed cutters.....	5,355
Horse powers.....	2,142
Portable engines.....	57,417
Portable saw mills and planing.....	1,087
Threshers and separators.....	41,654
Pumps	179,141
Stoves	251,524
Wire fencing	67,543
Wire fencing, free.....	316,664
Axes	29,590
Harness and saddlery.....	53,451
Grindstones	6,203
Total	\$2,985,086

Against this is to be placed a total exportation of similar articles amounting to only \$1,750,000. It would seem that the Canadian manufacturer of farm machinery and implements should be able to hold the home market against foreign competitors, for, though the duty on such machinery is but 20 per cent ad valorem, the duties on pig iron and steel are much less than they were previous to 1897, and are largely offset by the bounty on these products which are of home make. Also upon exports the Canadian makers of agricultural machinery are allowed a rebate of 99 per cent. of the duty they have paid upon any imported material in the finished product they are exporting.

Minor Notes.

An iron foundry company, with a capital of \$1,000,000, are being projected in Collingwood. Marine and stationary engines are to be manufactured.

A petition has been received by the Minister of Finance for a bounty on arsenic. It comes from parties interested in the mineral deposits in Hastings County, Ontario, from which arsenic is obtained. There are arsenic works at Delaro, in that county, at which 160 to 180 men are employed.

At a meeting of the Town Council of North Sydney on the 27th ult. a resolution was passed recommending the municipality give a bonus to the Nova Scotia Steel & Coal Company.

No action has yet been taken by any company to earn the bounty on lead provided for by a bill which passed the Dominion Parliament last session. A meeting was held in Nelson, B. C., a few days ago in order to discuss the question of starting a refinery.

La Chambre de Commerce, Montreal, passed a resolution at its last meeting, held a few days ago, urging the Dominion Government to offer a subsidy to encourage the building of ships.

C. A. C. J.

Mechanical Engineers.

New York Convention.

The final report of the Committee on Standardization of Engines and Dynamos was received. The report recommends certain sizes, speeds and standardized dimensions for direct connected generating sets. It covers the capacity and revolutions per minute, the armature bore for center and side crank engines, the diameter of the engine shaft at the armature fit, the space occupied on the shaft, the length of the extension pieces and height of the axis of the shaft above the top of the base, the width of the top of the sub-base, the width, thickness, depth in shaft and projection above the shaft, at the edge, of the keys and the diameters and number of the holding down bolts. The object of the investigation is to produce uniformity in engines and generators so that builders may work along the same lines.

In addition to the members present, as published last week, there were the following:

List of Members.

Almy, Darwin, Almy Water Tube Boiler Company, Providence.
 Ball, Frank H., general manager American Engine Company, Bound Brook, N. J.
 Barr, John H., Prof. Mach. Design, Cornell University.
 Barth, Carl George Lange, Bethlehem Steel Company.
 Bland, John P., Wm. Sellers & Co., Philadelphia.
 Blauvelt, Wm. Hutton, general manager, Semet Solvay Company, Syracuse, N. Y.
 Bole, Wm. A., superintendent, Westinghouse Machine Company, East Pittsburgh.
 Bond, Geo. M., manager standards and gauge department, Pratt & Whitney Company, Hartford.
 Bristol, W. H., professor of mathematics, Stevens Inst. Tech.
 Brown, Chas. S., professor of mechanical engineering Vanderbilt University.
 Bullard, Edward Payson, president The Bullard Machine Tool Company, Bridgeport, Conn.
 Coffin, Wm. Carey, vice-president Riter & Conley Mfg. Company, Pittsburgh.
 Colby, Albert Ladd, metallurgical engineer, The Bethlehem Steel Company, South Bethlehem.
 Dallett, Elijah, M. E., Mach. Dept., Midvale Steel Company, Philadelphia.
 Dean, Francis W., mechanical and mill engineer, Boston.
 Dodge, James M., president Link-Belt Engineering Company, and Dodge Coal Storage Company, Philadelphia.
 Edwards, Victor E., M. E. Morgan Construction Company, Worcester, Mass.
 Fellows, Edwin R., manager, The Fellows Gear Shaper Company, Springfield, Vt.
 Flagg, Stanley G., Jr., S. G. Flagg & Co., Philadelphia.
 Forbes, Wm. Dunderdale, Hoboken, N. J.
 Fritz, John, consulting engineer, Bethlehem.
 Gantt, Henry Laurence, Bethlehem Steel Company, South Bethlehem, Pa.
 Gleason, William, president, Gleason Tool Company, Rochester, N. Y.
 Goss, W. F. M., dean, Schools of Engineering, Purdue University, Lafayette, Ind.
 Greenleaf, Geo. Edward, The Pond Machine Tool Company, Plainfield, N. J.
 Grimm, Paul H., chief engineer, National Starch Company, Glen Cove, N. Y.
 Henning, Gustavus C., consulting engineer, New York.
 Hewlett, Edward M., engineer of switchboard department, General Electric Company, Schenectady, N. Y.
 Higgins, Milton P., president, Norton Emery Wheel Company and Plunger Elevator Company, Worcester, Mass.
 Hill, Warren E., vice-president, Continental Iron Works, Brooklyn.
 Howe, Henry M., professor of metallurgy, Columbia University.
 Hunt, Robert W., Robert W. Hunt & Co., Chicago.
 Hunt, Wm. Floyd, superintendent, C. W. Hunt Company, New York.
 Johnson, Arthur E., Des., Ordnance Office, War Department, Washington.
 Kerr, Walter C., vice-president, Westinghouse, Church, Kerr & Co., New York.
 Kingsbury, Albert, professor applied mechanics, Worcester Poly. Institute, Worcester.
 Kirchhoff, Charles, Editor, *The Iron Age*.
 Lewis, Wilfred, president, Tabor Mfg. Company, Philadelphia.
 Lieb, John W., Jr., associate general manager, The New York Edison Company, New York.
 Lilley, Geo. Henry, M. M., A. B. & C. Co., Ansonia, Conn.
 Mansfield, Albert K., mechanical manager, Buckeye Engineering Company, Salem, Ohio.
 Mayo, John B., M. E., Coe Brass Mfg. Company, Torrington, Conn.
 Melville, George W., Rear Admiral, Engineer-in-Chief, U. S. N., Washington.
 Melvin, David N., superintendent and engineer, American Linoleum Mfg. Company, Linoleumville, N. Y.

Mesta, George, president, Mesta Machine Company, Pittsburgh.
 Moore, M. F., president, Marine Engine & Machine Company, Harrison, N. J.
 Morehouse, Wm. S., superintendent, Rumsey & Co., Seneca Falls, N. Y.
 Morgan, T. R., secretary, Wellman-Seaver Engineering Company, Cleveland.
 Morlson, Geo. S., 49 Wall street, New York.
 Morris, Henry G., Bourse, Philadelphia.
 Mossberg, Frank, Attleboro, Mass.
 Pearson, Wm. Anson, Jr., mechanical engineer, General Electric Company, Schenectady, N. Y.
 Plummer, Frank J., superintendent, American Wood Working Machine Company, Norwich, Conn.
 Reed, Samuel Gordon, superintendent, Crosby Steam Gauge & Valve Company, Boston.
 Relss, George T., general superintendent, Niles Tool Works, Hamilton, Ohio.
 Rice, Richard H., treasurer, Providence Engineering Works, Providence.
 Richardson, George Partridge, assistant engineer, Isbell-Porter Company, Newark, N. J.
 Richmond, George, consulting engineer, De La Vergne R. M. Company, New York.
 Rohrer, Albert L., Elect. Supt., General Electric Company, Schenectady, N. Y.
 Rowland, Amory E., F. C. & A. E. Rowland, New Haven, Conn.
 Sargent, Wm. Durham, vice-president and general manager, The Sargent Company, Chicago.
 See, Horace, engineer and naval architect, 1 Broadway, New York.
 Shepard, Frank E., president and M. E., Denver Engineering Works, Denver, Col.
 Smith, Oberlin, president, Ferracute Machine Company, Bridgeton, N. J.
 Spangler, H. W., Prof. Dyn. Engrg., University of Pennsylvania.
 Stetson, George R., president and general manager, New Bedford Gas & Edison Light Company, New Bedford, Mass.
 Stroud, Edwin Gerrish, Stamford, Conn.
 Taylor, Fred. W., consulting engineer, Germantown, Pa.
 Thurston, Robert H., director, Sibley College, Cornell University.
 Torrey, Herbert Gray, U. S. Assayer, U. S. Assay Office, New York.
 Towne, Henry R., president, Yale & Towne Mfg. Company, Stamford, Conn.
 Trautwein, Alfred P., president and general manager, Carbondale Machine Company, Carbondale, Pa.
 Webber, Samuel S., manager, Trenton Iron Company, Trenton, N. J.
 Wellman, Charles H., general superintendent, Wellman-Seaver Engineering Company, Cleveland, Ohio.
 Wyman, Horace Winfield, Wyman & Gordon, Worcester.
 Zehnder, Chas. H., president, The Dickson Mfg. Company, Scranton, Pa.

Portable Accelerometer for Railway Testing

was the title of a paper by F. B. Carey. In all railway work, both steam and electric, the all important factor to be considered is speed, and it is often necessary to secure accurate data in regard to the rate at which the speed changes under various conditions of equipment and operation. To obtain the desired information from a continuous speed record is generally as unsatisfactory as it is laborious, and various devices have from time to time been tried in order to secure direct readings of acceleration and retardation of moving cars and trains.

The instrument described depends for its action upon the inertia of a small mass of mercury contained in a horizontal passage, the ends of which are in communication with two short vertical columns of mercury. Thus, the flow induced in the horizontal passage produces a difference of level in the vertical columns, which difference of level is wholly dependent on the horizontal component of the acceleration in the plane which passes through the axes of the two vertical columns. Upon this difference of level, or, rather, upon the change of level of either column from a given zero position, must depend the indication of the instrument. In a small instrument, however, such as might be conveniently carried in the pocket, this change of level is very small. For instance, assuming a distance of 4 inches between the centers of the mercury columns, the change of level would be less than $\frac{3}{8}$ inch for an acceleration of 4 miles per hour per second, which is about the maximum possible on steel rails. It is therefore evident that some method of manipulation must be used to secure a reading scale sufficiently extended for practical work. For this purpose colored alcohol or other liquid of low specific gravity is introduced into the spaces above the mercury columns, to which spaces the reading tubes are connected. The reading tubes are of comparatively small diameter. Thus the ratio of the cross section of the

mercury column to the cross section of the reading tube becomes approximately the multiplier of the changes of mercury levels. The upper ends of the two reading tubes are connected together so as to prevent evaporation and spilling of the liquids. The reading scale is provided with vertical adjustment to facilitate the proper location of the zero point.

By placing the instrument just described on a window ledge, or other convenient place, the acceleration and retardation of any car may be observed.

H. L. Gantt presented in detail a

Bonus System of Rewarding Labor.

This system was recently introduced in the large machine shop of the Bethlehem Steel Company. It is explained to be an attempt at harmonizing the interests

ways gets. If, however, at the end of the day he has failed to accomplish all of the work laid out he does not get his bonus, but simply day rate. As the time for each detail operation is stated on the instruction card the workman can see continually whether he is earning his bonus or not, and if he finds any operation which cannot be done in the time set, he must at once report it to his foreman. If, on careful investigation by the man making out the card, the workman's statement is found to be correct—that a portion of the task cannot be done in the time stated on the card—a new instruction card is made out, explaining the proper method of working and allowing the proper time. It is of the greatest possible importance for the moral effect upon the men that errors in making out instruction cards should be as few as possible. A man must be allowed time only for

CLASS OF WORK		STANDING ORDER	ORDER NUMBER				
Lathe		376	17345				
MACHINE NO.	TOOL	CLASS OF METAL	FORGING NUMBER				
145	M E	38	14539 4				
MAN'S NAME Wm. Jones		SPEED BOSS Theo. Smith					
DESCRIPTION OF OPERATION	SHAPE OF TOOL	CUT	FEED	SPEED	TIME WORK SHOULD TAKE	TIME WORK DID TAKE	RATE
1 Chuck					2.8		
2 Face end	P V M			8 B F	4.0		
3 Turn half way	P R L	1/2	J		12.0		
4 " end for end					5.0		
5 " half way	P R L	1/2	J		12.0		
6 Face end	P V M				4.0		
7 Remove from machine					2.8		
8					48.0		
9							
10							
11	Inside lines in sketch represent machined, and outside lines forged, sizes.						
12							
13							
14							
15							
16							
17	Note.—Sketches are not usually put on the instruction cards, but are put on here for convenience.						
18							
19							
20							
21							
22							
23							
INSTRUCTION CARD NO. 4327		SHEET DRAWING NO. 866746		B. S. CO. DRAWING NO. 6		MONTH DAY YEAR 1 1 1901	
						SIGNED Buckley	

WHEN MACHINE CAN NOT BE RUN AS ORDERED, SPEED BOSS MUST AT ONCE REPORT TO MAN WHO SIGNED THIS SLIP.

Fig. 1.

CLASS OF WORK		STANDING ORDER	ORDER NUMBER				
Lathe		380	17059				
MACHINE NO.	TOOL	CLASS OF METAL	FORGING NUMBER				
28	M E	38	2834 B 1 F 8				
MAN'S NAME		SPEED BOSS					
DESCRIPTION OF OPERATION	SHAPE OF TOOL	CUT	FEED	SPEED	TIME WORK SHOULD TAKE	TIME WORK DID TAKE	RATE
Change machine 10 minutes (for 1st one only)							
1 Chuck					04		
2 Turn half way	P R L	1/2		8 A F	30		
3 Face end	P V M				17		
4 Turn end for end					06		
5 Face end					17		
6 Turn half way	P R L				30		
7 Remove piece					03	Ar. m.	
8					1:47	1:50	
9	(Bonus not earned)						
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20	Previous time on another lathe 5 1/2 hrs.						
21							
22							
23							
INSTRUCTION CARD NO. 5613		SHEET DRAWING NO. P C A C		B. S. CO. DRAWING NO. 85304 C		MONTH DAY YEAR 9 18 01	
						SIGNED Buckley	

WHEN MACHINE CAN NOT BE RUN AS ORDERED, SPEED BOSS MUST AT ONCE REPORT TO MAN WHO SIGNED THIS SLIP.

Fig. 2.

BONUS SYSTEM OF REWARDING LABOR.

of the employer and employee, and while it affords substantial justice to the latter, requires that he shall always conform to the best interests of his employer. That it accomplishes such a result is shown by the fact that it has caused a complete change in the whole atmosphere of a shop, although it has been in operation only a few months.

Description of System.—A card is made out, showing in detail the best method (so far as our present knowledge goes on the subject) of performing each of the elementary operations on any piece of work, specifying the tools to be used, and setting the time needed for each of these operations as determined by experiments. The sum of these times is the total time needed to complete the piece of work. If the man follows his instructions and accomplishes all the work laid out for him, as constituting his proper task for the day, he is paid a definite bonus in addition to the day rate which he al-

what is stated on his card, and while a reasonable time must be allowed for each operation, he should fail to receive his bonus if time is lost from any cause whatever.

As these cards are made out by a skillful man, with the records at hand, they invariably prescribe a better method for doing the work than the ordinary workman or foreman could devise on the spur of the moment. As all the appliances and instructions necessary for doing the work are furnished and a fixed premium or bonus is allowed the workman in addition to his regular rate if the work is done satisfactorily in the time set, it will be seen at once that this method is really a system of education, with prizes for those who learn, and the results already obtained bear out this idea of education most fully, for under it men have learned more in a few months than they ever did before in years.

Breakdowns.—Again, as it is impossible for the men to earn their bonuses when their machines are out of

order, it furnishes an automatic punishment for breakdowns, for the man not only loses his bonus on the day the machine breaks down, but on all subsequent days until the machine is running satisfactorily again.

The author then explains that the system possesses an advantage over direct piece work, in that it is more flexible and can be introduced with greater ease and under conditions where piece work proper would be impossible. In order to get the information necessary to fix proper piece rates, or even to make out good instruction cards, a very large amount of detail work is necessary. The author divides this into an analysis of the operation into its elements, a study of these elements separately and a synthesis or putting together the results of this study.

illustration of exactly how instruction cards are made out in a machine shop we may cite the case of a forging that has to be rough machined. The drawing first goes to an expert mechanic, who has charge of what is known as the routing of the piece through the shop. He decides the order in which the various operations of turning, planing, slotting, drilling, &c., are to be done. In a shop doing a variety of work too much stress cannot be laid on the routing, for, besides the advantage of knowing in the office the progress of the work, the saving made by performing the various operations in the best order is very great. This subject of routing is large enough to take up a paper by itself, so it can only be mentioned here. If the first operation to be performed is that of turning, the forging is assigned to the lathe

CLASS OF WORK		STANDING ORDER		ORDER NUMBER	
Laths		480		15337	
MACHINE NO.	TOOL	CLASS OF METAL		FORGING NUMBER	
50	M E	14		2706 B 1 P 1	

MAN'S NAME		SPEED BOSS	

DESCRIPTION OF OPERATION	SHAPE OF TOOL	CUT	FEED	SPEED	TIME WORK SHOULD TAKE	TIME WORK END TAKE	RATE
Change machine 80 minutes (for 1st one only)							
1 Check for turning webs					15		
2 Turn webs	P R L	3 cuts	E	4 A F	1:40		
3 Change to Pin Centrus					15		
4 Rough Pin to 1 1/2 dia.	P S R			0.005	5 A F	2:10	
5 R face web was double end tool		2 cuts		4 A F	1:40		
6 Finish " " " "		1 cut	H	"	50		
7 Finish turning pin & cut fillets				E	2 A F	2:00	
8 File pin round					1:10		
9 Polish pin				1 B F	40		
10 Inspect					" 15		
11 Remove crank					65	hr min	
12					10 55	10:50	
13	Pin is No. 1 finish			webs are No 3 finish			
14	(Bolus out road)						
15							
16							
17							
18							
19	Previous time 5 1/2 hours						
20							
21							
22							
23							

INSTRUCTION CARD NO.	SHEET DRAWING NO.	S. & CO. DRAWING NO.	MONTH	DAY	YEAR	SIGNED
4811	P M C B	86194 A	7	17	01	Buckley

WHEN MACHINE CAN NOT BE RUN AS ORDERED, SPEED BOSS MUST AT ONCE REPORT TO MAN WHO SIGNED THIS SLIP.

Fig. 3.

DD FORM 1, 7-54

CLASS OF WORK <i>Lathe</i>		STANDING ORDER <i>870</i>	ORDER NUMBER <i>17551</i>
MACHINE NO. <i>100</i>	TOOL <i>M 1</i>	CLASS OF METAL <i>15</i>	FORGING NUMBER <i>18253 B i F 1</i>

MAN'S NAME _____ SPEED BOSS _____

DESCRIPTION OF OPERATION	SHAPE OF TOOL	CUT	FEEB	SPEED	TIME WORK SHOULD TAKE	TIME WORK DID TAKE	RATE
Change machine 5 minutes (for lat on's only)							
1 Chuck $3\frac{1}{2}$ " to P P					<i>2\frac{1}{2}</i>		
2 Turn $3\frac{1}{2}$ " x $2\frac{1}{4}$ " long	<i>P R L</i>	$\frac{1}{8}$	$\frac{1}{8}$	<i>S B F</i>	<i>11</i>		
3 Face end	<i>P F M</i>			"	<i>05</i>		
4 Turn end for cut				"	<i>04</i>		
5 Face end	"			"	<i>06</i>		
6 Turn $3\frac{1}{2}$ " Dia.	<i>P R L</i>	$\frac{1}{8}$	"	"	<i>08</i>		
7 Turn $3\frac{1}{2}$ " "	"	$\frac{1}{8}$	"	"	<i>03</i>		
8 Remove piece					<i>2\frac{1}{2}</i>		
9					<i>33</i>	<i>2\frac{1}{2} min</i>	
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							

Previous time taken 1 hr. 6 min.

INSTRUCTION CARD NO.	SHEET DRAWING NO.	D. S. CO. DRAWING NO.	MONTH	DAY	YEAR	SIGNED
<i>5263</i>		<i>6258</i>	<i>9</i>	<i>18</i>	<i>61</i>	<i>Buckley</i>

WHEN MACHINE CAN NOT BE RUN AS ORDERED, SPEED BOSS MUST AT ONCE REPORT TO MAN WHO SIGNED THIS SLIP.

Fig. 4.

BONUS SYSTEM OF REWARDING LABOR.

Application of Instruction Cards to a Machine Shop.—In order to make proper instruction cards for a machine shop doing a variety of work it is necessary to know the laws of the cutting of metals, as well as the time for handling work in this particular shop. The laws referred to are very complicated, but F. W. Taylor has made such a start as to render it possible to determine the best method and time for rough machining steel. The results of his experiments on lathes were reduced to a slide rule by the writer for convenient use. This slide rule has been improved by Carl G. Barth, who has also extended it to planers, drill presses and slotters, and who made out slide rules for a number of machines in the large machine shops of the Bethlehem Steel Company. By means of these slide rules we can determine promptly the most economical feed and speed with which to perform any operation on a piece of steel when the physical qualities of the steel are given. As an il-

best fitted for handling this particular job. The work to be done on the machine is then analyzed by a first-class machinist, who has been instructed in the use of the slide rule, and who makes out an instruction card on which the operations to be performed on this lathe are placed in the proper order, with proper instructions, the calculated time being given for performing each operation. The kind of tool to be used, the feed and speed are specified for every machine operation. For every other operation, such as putting in and taking out work, laying out, changing feed gears, &c., instructions are given, and the time that each should take is placed directly opposite the description, in a column designed for that purpose. Fig. 1 is a sample card for rough turning a locomotive piston rod.

This card represents instructions given to William Jones, whose boss is Thomas Smith, to do work on Forging No. 14,653C4, Manufacturing Order No. 17,344, in

Lathe No. 145, according to Standing Order No. 376. The hardness of the metal is represented by class 12. He must use tools made of "M E" steel, of the shape designated in the column calling for shape of tool. The approximate depth of cut in turning is 3-16 inch. "J" represents a combination of feed gears, and "2-BF" a cone speed which he must use. Opposite each operation are seen complete instructions giving the kind of tool, cut, feed and speed that must be used in order to accomplish the work in the time set. The total time for turning and facing this forging is shown to be 42 minutes. At the bottom of this card is given, first its number, then the drawing number of the assembling sheet, if we have such a sheet; then the detail drawing for this particular piece, and next the date and signature of the man who made out the card. The note at the bottom—namely, "When machine cannot be run as ordered, speed boss must at once report to the man who signed this slip," is put on in red ink and should be observed to the letter.

By means of this card filled out from the slide rule, together with records of the time necessary to do miscellaneous operations, which for simplicity we shall call hand work, we can instruct a very ordinary man in the best method of doing any job of this character. Considerable training, of course, is necessary to teach the men, who, as a rule, are ordinary laborers, to follow these cards. Having once given them this training, however, the advantage of having a first-class machinist to do the thinking, and to use for them the best results already obtained, produces an efficiency which would be absolutely impossible if the workmen were left to themselves.

For further illustration I give three more cards, Figs. 2, 3 and 4, which are made out in the same manner as the first one. One of these is for a far more complex operation, and it may be of interest to note that cards are frequently made out that are twice as long as this one.

Results.—This system of instruction cards was introduced by the writer into Machine Shop No. 2 of the Bethlehem Steel Company, in June, 1899, with markedly beneficial results, which increased as the men making out the cards became more and more skillful and the cards were made out more and more in detail. There was comparatively little difficulty in causing the men to perform the automatic operations according to the instructions given. For instance, they would run their machines at the feed and speed called for, but the great difficulty was that it seemed impossible to prevent them from losing time between operations. One would frequently find many of the machines idle, and yet every workman could give a more or less plausible excuse why his machine was not running, and this in spite of the fact that tools were ground for him and furnished to him, and the work so prepared that all he had to do was to put it in the machine and begin cutting. In other words, no matter how efficiently the machines were run through their actual working time, the men found good excuses for taking more than the prescribed time on every job, and for wasting enough time to hold down the output of the shop very materially.

Bonus.—To overcome this difficulty it was proposed by the writer that every man who succeeded in doing all the work called for by his instruction cards for a complete turn should receive a bonus, or premium. When this payment of a bonus went into effect the amount of time wasted diminished very rapidly, and soon a majority of the men on the machines were earning their bonuses regularly. In order to be sure that they got all the assistance possible from the foreman, he, too, received a definite premium for each machine under his charge that made its bonus, and in order that the poorer men might receive sufficient instruction from the foreman it was made to his interest to give them special attention. That was accomplished in this way: While the foreman was given a definite amount for each machine that earned its bonus, he was given an additional 50 per cent. if all the machines under his charge earned their bonus, thus making it to his interest to give special attention to the men most likely to fall behind.

Results of Bonus.—Inasmuch as no bonus whatever is paid unless the men actually perform the work called for on their instruction cards in the time set, it is to the interests of the men to prevent accidents to the machines, and to avoid unnecessary delays, whether such delays are their own fault or the fault of other people. Among the results we have obtained are:

1. A very large increase in output, averaging from 200 to 300 per cent.
2. A falling off in accidents and breakdowns.
3. A quickening of the intelligence of the men.

For instance, men who could formerly do nothing for themselves, but were obliged to ask the foreman all kinds of questions, now find that they can do the work by asking fewer questions, for if they spend a large proportion of their time hunting the foreman they lose their bonus. One man, for instance, who in three years had never learned to change the feed gears of his machine properly without the assistance of his foreman, lost his bonus three days in succession because they had not been properly set. He at once learned to set them, and has had no difficulty from this cause since.

The author then compares the bonus and piece work systems, and says that the greatest difficulty is to convince the men that the instruction cards are intended to be such as a man familiar with the work can, by industry and with a fair amount of intelligence, always successfully follow.

The system is specially applicable to work done on automatic machine tools, where efficient running of the tools counts more than manual dexterity. If, on the other hand, the work is such that manual dexterity or strength is the main factor, it will be usually necessary to offer, in addition to the bonus for maximum efficiency, one or more bonuses for definite approximations to this maximum. This, however, is one of the numerous modifications that will suggest itself when a proper system of instruction cards and records has been introduced.

Output Increased.—During the year from March 1, 1900, to March 1, 1901, the machine shop was run day and night as hard as the machines could be pushed by day work alone, and still the increasing output of the forge was piling up work ahead of it. It was at this juncture that the bonus system was put in operation. To realize what happened in the few months after the introduction of the bonus it is, perhaps, best to compare the shipments during those months with the average monthly shipments for the preceding year. I do not feel at liberty to give the actual shipments, but if we represent by unity the average monthly output of the shop during the year from March 1, 1900, to March 1, 1901, the following figures will represent the output for the five months succeeding the introduction of the bonus system:

Average shipments per month for year from March 1, 1900, to March 1, 1901.....		1.00
Shipped in March, 1901.....		1.25
" " April, ".....		1.53
" " May, ".....		1.86
" " June, ".....		1.98
" " July, ".....		2.17

The bulk of the above shipments consisted of rough machined forgings, and before the end of July the machine shop had caught up to the forge so closely that there was not enough work to keep all the machines running day and night, and a large number were shut down on the night turn. The output of the shop during August was far below that of July, for the reason that the forge did not furnish anything like work enough to keep it busy.

A Silent Chain Gear

was described by J. O. Nixon. This paper deals with the Renold chain gear, which has been in successful use in Europe for five years. It consists of a chain composed of links of a peculiar form stamped from the sheet or cut from a drawn bar and fastened together by shouldered rivets into a chain of any desired width. It is silent and may be run at high speeds.

The Bursting of Small Cast Iron Fly Wheels,

by Prof. C. H. Benjamin, considers a series of experiments upon 16 wheels of different patterns, each being 24 inches in diameter. Wheels Nos. 1 and 2 were solid cast rims of the Allis pattern and were used as a standard for comparison. They failed at a rim speed of about 395 feet per second and a centrifugal tension of 15,600 pounds per square inch. Nos. 3 to 6 had two flanged joints in the rim at one-fourth of the distance from one arm to the next. They failed at 194 feet per second and 3750 pounds per square inch, and were no stronger than with the joint midway between the arms. No. 7 was a model of a blowing engine fly wheel, with links shrunk into the rim; it failed at 256 feet per second and 6600 pounds per square inch. Nos. 8 and 9 were solid rims, with wire spokes tightened by nuts; they failed at 424 feet per second and 18,000 pounds per square inch. No. 10 had the usual flanged joints, bolted together, but unsupported, while Nos. 11 and 12 were strengthened by steel tie rods running from hub to rim and bolted in; No. 10 burst at 164 feet per second and Nos. 11 and 12 at an average of 225 feet per second. Nos. 13 and 14 were made with solid rims, and with the arms and hub cast in a single piece, and the ends of the arms bolted between ears which projected inward from the rim; they burst at a speed of 392 feet per second. Nos. 15 and 16 were made with the rim in halves, bolted together by a flanged joint, and the arms and hub cast in one piece, the arms being bolted to the rim by flanges cast on their ends and cap screws screwed into bosses on the inside of the rim; the average bursting speed was 223 feet per second.

The following conclusions are drawn: For wheels of moderate size, correctly proportioned, the solid rim is by far the safest form and will require a speed of from 350 to 400 feet per second to produce rupture. The stress due to bending is so small as to be negligible. Jointing the arms at the rim and bracing the rim by internal webs have no important effect on the strength. Joints in the rims are the principal source of weakness, especially if located between the arms. Probably no joint can be made for a rim of solid cross section which will be more than one-third as strong as the rim itself. Hollow rims will permit of a much more efficient joint, as has been shown by John Fritz in his paper read at the meeting of this society in May, 1899. The joints in Mr. Fritz's wheel are practically as strong as the rest of the rim. This construction is hardly possible in wide faced band wheels such as are used on most shop engines. The English wheels, Nos. 8 and 9, show clearly the advantage of numerous arms on any type of wheel. Even if the rims were jointed such wheels would prove their superiority to those with the ordinary arms in maintaining their shape at high speed.

C. W. Hunt presented a paper on

Working Loads for Manila Rope,

which is, in part, as follows:

The technical reference books in use by engineers do not contain definite information in relation to the proper working loads for manila rope when used in tackle blocks or for cargo hoisting. The hoisting of heavy weights is an important branch of erecting work, and I desire to record in the proceedings of the society a statement of the result of an extended experience, together with some examples of the life of rope in actual service, which will be a guide to engineers in judging what service can reasonably be expected in similar cases.

The ultimate strength given in Table II is materially affected by the age and condition of a rope in active service, and also it is said to be the fact that rope is weaker when it is wet. Trautwine states that a few months of exposed work weakens rope 20 to 50 per cent. The ultimate strength of a new rope given in column B is the result of tests made by the company which whom I am connected of full sized specimens of manila rope, purchased in the open market, and made by three independent rope walks. The results were given in a paper printed in the "Transactions" of this society. Prof. B. Kirsch of the Imperial Royal Technological Industrial Museum, in Vienna, has since broken over 200 specimens

of rope, mostly 35 mm. (1½ inches) and 55 mm. (2½ inches) diameter, and his results agree within 5 per cent. with these figures. Professor Kirsch demonstrated that within the limits of commercial sizes of hoisting rope the full strength could be obtained for larger as well as for smaller sizes. When the strength falls off the rope is imperfectly laid, or made on a machine too weak for the work. The ultimate strength of rope is, in this class of work, useful for one purpose only—that is, to estimate the factor of safety with any given stress. The strength given is for ordinary commercial rope, which may be greatly exceeded in strength by rope made of selected materials. The table can be depended upon as a reliable and safe guide in estimating the factor of safety for any case in hand.

Diameter of Sheaves.—The proper diameter of pulley block sheaves for different classes of work, given in columns F, G and H (Table II), is a compromise of the various factors affecting the case. An increase in the diameter of sheave will materially increase the life of a rope. The advantage, however, is gained by increased difficulty of installation, a clumsiness in handling and an increase in first cost. It can safely be assumed that the best size is one that balances the advantages and the drawbacks as they are found in practical use and makes a fair balance between the conflicting elements of the problem.

An abundance of data is available from which to draw a reasonable conclusion in the premises. A few typical illustrations will make clear the method of procedure, and also be of service in showing what changes in sizes or proportions an engineer, in any given case, could make to reach a higher efficiency of mechanism or a greater commercial economy. In driving 28,908 piles on the Chicago, Milwaukee & St. Paul Railway the engineering department kept an accurate account of the number of piles driven by each one of the 79 lines of various sizes of manila rope used. From this record the average number of piles driven by each size of rope was computed, and also the cost of rope per pile driven was ascertained. This account showed that for hammers weighing from 1800 to 2600 pounds 1½-inch diameter rope was the best, and for hammers from 2600 to 3200 pounds rope 1¾ inches in diameter should be used. Similar records covering many years have been kept by various coal dealers of the diameter and cost of their rope per ton of coal hoisted from vessels, using sheaves of from 12 to 16 inches in diameter. These records show conclusively that in hoisting a bucket that produces 900 pounds stress upon the rope a 1¼-inch diameter rope is too small and a 1¾-inch rope is too large for economy. The size in general use for this work is 1½ inches. The Pennsylvania Railroad Company use 1½-inch rope, running over 14-inch diameter sheaves, for hoisting freight on all their lighters in New York harbor, and handle on a single part of the rope loads up to 3000 pounds as a maximum. Greater weights are handled on a six-part tackle.

Robert Grimshaw in 1893, in collaboration with Lieut. J. A. Bell of the Equipment Bureau, U. S. N., made a series of tests at the Brooklyn Navy Yard on sheaves of various diameters and with various loads. The rope was ordinary manila, three strand, 3¾ inches in circumference, such as is used in the United States Navy. It was dry and tested on a "cat and fish" tackle constituting a six-fold purchase; sheaves 8 inches in diameter, the three upper ones having roller bearings and the three lower ones plain solid bushings. The lower block and hook weighed 75 pounds.

Life of a Rope.—It is interesting to compare the life of a rope when used with the stresses and sheaves given in columns C and F (Table II) and one used with those of columns D and G. To illustrate this, take two cases using exactly the same size and quality of rope, one to be worn out in hoisting coal from vessels, with stresses and sheaves as per columns D and G, and the other to be used on a rope drive, with the stresses and sheaves as per columns C and F; all the wear on the ropes comes from its internal friction in bending over the sheaves and its external chafing in running on and off

them. A record of the number of bends made by each of the ropes will be a convenient means of comparison. A rope $1\frac{1}{2}$ inches in diameter usually hoists from a vessel from 7000 to 10,000 tons of coal on a well arranged hoist. The rope will have a working stress of from 850 to 900 pounds running over three sheaves, one 12 inches and two 16 inches in diameter; in hoisting 10,000 tons it makes 20,000 trips, bending in that time from a straight line to the curve of the sheave, or *vice versa*, 120,000 times. The rope, when this service is completed, is worn out and must be replaced by a new one.

To illustrate the endurance of the rope used in the transmission of power, take a tin plate mill transmitting 1000 horse-power to the rolls by means of $1\frac{1}{2}$ -inch diameter manila ropes. In one particular case the sheaves are 5 feet and 17 feet in diameter and 36 feet apart, center to center. The rope is 86 feet long, runs 5000 feet per minute, making 13,900 bends per hour, or more bends in nine hours' service than the other rope made in its entire life. As is well known, the life of a transmission rope is measured by years, not hours. This enormous difference in the life of ropes of the same size and quality is wholly gained by reducing the stresses on the rope and increasing the diameter of the sheaves.

Weakening Effects.—The weakening effect given in the table of various knots, hitches and bends used in rope tackle is based upon experiments made in the laboratory of the Massachusetts Institute of Technology. Forty-five pieces of $2\frac{1}{2}$ -inch circumference, three-strand manila rope, cut from one coil, were broken in sets of from three to seven ropes, each rope of a set having the same fastening, and an average of each set computed. Each different set tested some one of the fastenings in common use. The results were not erratic, but consistent, and from them a safe conclusion can be drawn. In examining the various knots broken it is evident that those fastenings in which the standing part makes a short bend over another part of the rope are the weakest. Those like a round turn and a half hitch, or a timber hitch, have a less abrupt bend in the standing part, and are materially stronger. With care an eye in the end of a rope having the ends of the strands tapered down can be spliced over an iron thimble so that it will have substantially the full strength of the rope, but as it is usually made it is not so strong, for which due allowance is made in the table. The same remarks apply to a splice in a rope. In the table some knots are included that were not tested, but whose approximate strength is evident from their formation. The table is only a guide to be used in estimating the factor of safety. The loss of efficiency by the use of these knots was conclusively settled by the experiments above mentioned and the numerical value fixed within such narrow limits that the results cannot safely be ignored in executive work.

It will be understood that a table of working loads must be a general one, covering ordinary cases arising in practice. Local conditions may be such as to make it advisable to vary from the stresses given in the tables. In cases of great importance an engineer should carefully investigate the subject in detail and then decide upon the exact stresses that he will put on his tackle, but ordinary cases are fully covered by the data given in the tables herewith.

In this table the work required of the rope is, for convenience, divided into three classes—"rapid," "medium" and "slow," these terms being used in the following sense:

"Slow"—Derrick, crane and quarry work; speed from 50 to 100 feet per minute.

"Medium"—Wharf and cargo, hoisting 150 to 300 feet per minute.

"Rapid"—400 to 800 feet per minute.

The diameter of the rope in column A is obtained by dividing the girth by 3.1416. This method gives for a three-strand rope nine-tenths and for a four-strand ninety-three hundredths of the diameter of a circumscribed circle. The girth method corresponds closely to the circular diameter of the rope when under stress and is the most convenient method to use.

Table I.—From Grimshaw Report.

Net load on tackle.	Theoretical amount required to raise the net weight.	Actual power required.	Extra power required over the theoretical.	Per cent.
Pounds.	Pounds.	Pounds.	Pounds.	
660	100	158	58	58
800	139.3	198	64.3	48
1,000	166.7	243	76	45.8
1,300	200	288	88	44

Table II.—Working Load for Manila Rope.

A.	B.	C.	D.	E.	F.	G.	H.
Diameter of rope	Ultimate strength.	Working load in pounds			Minimum diameter of sheaves in inches.		
		Rapid.	Medium.	Slow.	Rapid.	Medium.	Slow.
1	7,100	200	400	1,000	40	12	8
$1\frac{1}{2}$	9,000	250	500	1,250	45	13	9
$1\frac{3}{4}$	1,000	300	600	1,500	50	14	10
1 $\frac{1}{2}$	13,400	380	760	1,900	55	15	11
$1\frac{3}{4}$	15,800	450	900	2,200	60	16	12
1 $\frac{1}{2}$	18,800	530	1,100	2,600	65	17	13
$1\frac{3}{4}$	21,800	620	1,250	3,000	70	18	14

Table III.—The efficiency of Knots in a Percentage of the Full Strength of the Rope, and the Factor of Safety when Used with Stresses as per Column E, Table II.

I.	J.	K.	L.	M.	N.	O.	P.
The efficiency of the knot.	Eye splices over an iron thimble.	Short splice in the rope.	Timber hitch, round turn and half hitch.	Bowline slip knot, clove hitch.	Square knot, weavers' knot, sheet bend.	Flemish loop, overhead knot.	Rope dry. Average of four tests from the same coil as the knots.
90	90	80	65	60	50	45	100
Factor of safety	6.3	5.5	4.5	4.2	3.5	3.1	?

American Competition from a German Standpoint.

In view of the feeling which has been stirred up in Germany by the prospect of increasing American competition, the following extract from an article in the *Vossische Zeitung* of Berlin, by the correspondent of that journal at Essen, is of interest:

In the circle of large operators in the Lower Rhine-Westphalian iron and coal district, the efforts of the United States to supply the continent of Europe with iron manufactures and coal are regarded with great interest and growing anxiety. A leading ironmaster of the Ruhr district recently expressed himself to a small circle of technical colleagues to the effect that within a period of 10 to 15 years America would be supplying all Mediterranean countries, including Austria-Hungary, with coal and iron. As reasons for this opinion, he stated that no other country can produce and transport iron in enormous quantities so cheaply and under such favorable conditions as the United States. When it is found that the necessary return freight from Europe for their coal ships is wanting, they will build their colliers so that they can use water ballast on their return voyage. The ocean freight schedules of all maritime nations will be so depressed by this competition that the item of sea transportation will play practically no role in the economy of international trade. It will be then, even more than now, a simple question of which country can produce most cheaply, and that country will unquestionably be the United States, with its virgin soil and its inexhaustible mineral resources. An effective protection against this deluge of American products through high tariffs will be impossible, because the United States can dispense entirely with European manufactured merchandise, and thus be in a position to close its frontiers to foreign trade. Europe will then have but one recourse which can provide any effective resistance to America, and that will be when all countries here form a close commercial union or league. Otherwise the material strength and resources of the contestants will be too unequal.

The Pressed Steel Car Company of Pittsburgh have received an order from the Bessemer & Lake Erie Railroad for 1000 steel cars of the hopper pattern, with a capacity of 50 tons each. The Bessemer & Lake Erie Railroad is also placing orders for a large number of locomotives.

The Monterey Steel Plant.

During the recent visit of the American Institute of Mining Engineers in Mexico no development in that country excited more interest than the large steel works now in course of construction at Monterey. We are indebted to William White, Jr., of Pittsburgh, consulting engineer of the Compania Fundidora de Fierro y Acero de Monterey, for the following data relating to this enterprise:

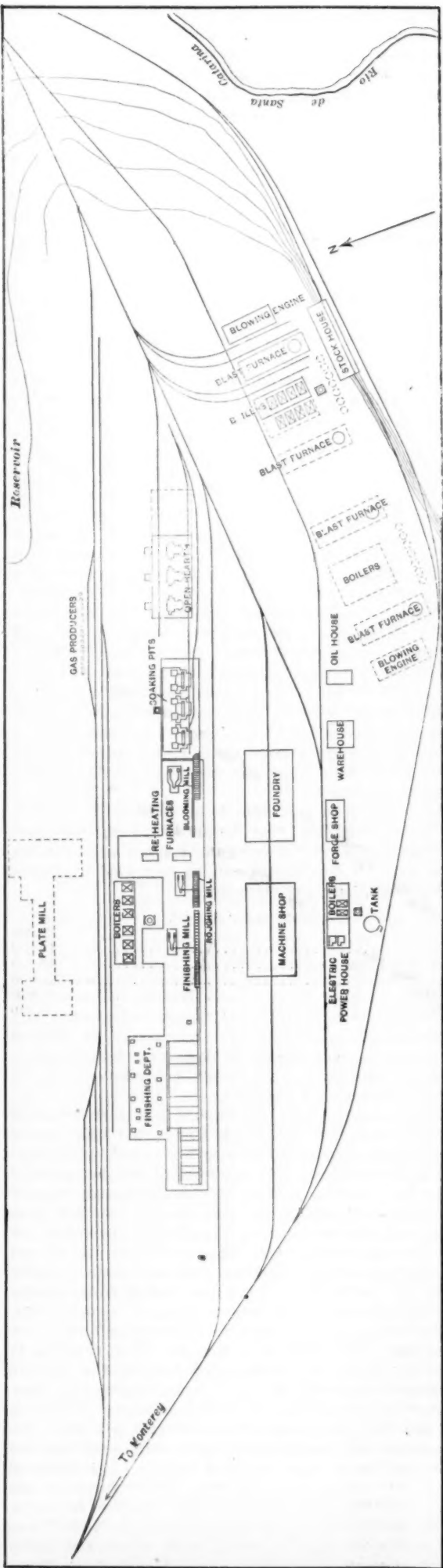
History.—The making of iron and steel from the ores of Northern Mexico was for years a favorite project of the late Don Patricio Milmo, upon whose estate large deposits of coal and iron were known to exist. Interested with Milmo was Eugene Kelly of New York, and during the consideration of the subject quite a number of examinations were made by different engineers. Failing health caused Mr. Milmo to relinquish an active part in the matter, but Mr. Kelly carried on the project, and associated himself with Don Vicente Ferrara of Monterey, Antonio Basagolti and Leon Signoret of the City of Mexico, and other prominent gentlemen of Monterey, New York and the City of Mexico, who founded a company. Subsequently, in May, 1900, there was organized the Compania Fundidora de Fierro y Acero de Monterey, with a capital of \$10,000,000.

The organization of the company is as follows: President, Vicente Ferrara; vice-president, Isaac Garza; treasurer, Constantino de Tarnava; secretary, Adolfo Zambrano, the directors being Antonio Basagolti, Leon Signoret, Eugene Kelly, Vicente Ferrara, Thomas Bramff, Adolfo Zambrano, Isaac Garza, Valentini Riviero and Ernesto Madero.

The reasons for locating at Monterey are as follows: If we assume Monterey as a center, and the distance from Monterey to Laredo as a radius, the circle so described will contain all the known deposits of iron ore of Bessemer quality and a larger part of the available coal in the Republic. At the same time Monterey possesses the advantage of being connected with all the trunk lines of the Republic, and by them to the Gulf of Mexico. Monterey possesses, therefore, all the conditions necessary for a manufacturing plant—viz., cheapness in the assembling of the raw materials and means for a wide distribution of the product. Monterey also contains a number of enterprising citizens, who have been successful in mining, smelting and manufacturing operations, and has a sufficiently large population to supply the necessary labor.

Iron Ore.—The company's iron mines are on the Carrizal Mountain, on the Mexican National Railroad, and at Monclova, on the Mexican International Railroad. As the mines at the Carrizal are sufficiently large to supply all the present needs, two mines, the Piedra Iman and the Anillo de Hierro, are being developed. They are reached by a branch of the Mexican National Railroad 5 miles from Golondrina station. The ore is brought to the loading terminal by two Bleichert tramways, and arranged to load 1000 tons per day. The outcrop of the Piedra Iman is 79 feet in width and 300 feet in height, and the outcrop of the Anillo de Hierro is 120 feet in width. Developments indicate persistence of the deposits. A third very large deposit is the Cinco de Mayo, which will be developed as the occasion requires. The variety of the ores is indicated by the fact that the Piedra Iman is a magnetite, the Anillo de Hierro is a hematite, and the Cinco de Mayo is a brown hematite. The analyses of the ores by Dr. Otto Wuth of Pittsburgh are as follows:

	Anillo Cinco de Mayo.			Monclova.	
	Piedra Iman. Magnetite.	de Hierro. Hematite.	Brown hematite.	No. 1.	No. 2.
Silice acid....	5.41	2.42	2.90	2.51	3.85
Alumina	1.03	0.79	1.12	1.51	1.04
Peroxide of Iron ...	96.22	78.86	95.05	93.42	...
Magnetic Iron..90.83	...	...	...	...	...
Lime	1.93	0.10	4.25	0.28	0.85
Magnesia	0.42	trace.	1.60	0.12	0.05
Peroxide of manganese	0.25	0.37	4.51	0.43	0.27
Sulphuric acid..trace.	...	none.	trace.	trace.	0.47
Phosphoric acid. 0.130	0.101	0.051	0.101	0.050	...
Copper	none.	trace.	...	...	...
Metallie Iron...65.78	67.35	52.02	66.53	63.39	...
Phosphorus ... 0.056	0.044	0.022	0.044	0.022	...



PLAN OF THE MONTEREY STEEL WORKS.

Coal.—The company own 30,000 acres of the Laredo coal field, and are largely interested in the coal field at Barroteran. Developments by the Mexican Coal & Coke Company, at Barroteran, show a coal seam of 9 feet in thickness, and of a quality such as to make a coke suitable for blast furnace use. The analysis of the Barroteran coal and coke is as follows:

	Coal.	Coke.
Moisture	2.00	...
Volatile matter.....	20.50	1.40
Fixed carbon.....	67.70	87.30
Ash	9.80	11.30
Totals.....	100.00	100.00

Monterey being in a limestone district, the limestone is of an exceptional quality, and the quantity is inexhaustible.

Manganese ores varying from 40 to 55 per cent. of metallic manganese, and low in phosphorus, are available, so that the products of manganese needed will not require to be imported.

The Plant.—The manufacturing plant of the Compania Fundidora de Fierro y Acero de Monterey is located on a tract of land about 600 acres in extent and 3 miles east of the city of Monterey. The buildings are of steel frame and brick construction, and built by the American Bridge Company. The dimensions of the buildings are as follows: Blast furnace house, 200 x 50 feet; blast furnace cast house, 180 x 50 feet; blast furnace blowing engine house, 130 x 50 feet; blast furnace boiler house, 135 x 50 feet; open hearth building, 204 x 100 feet; mill building, 1284 x 100 feet; mill boiler building, 200 x 50 feet; rail finishing building, 196 x 50 feet; foundry building, 225 x 120 feet; machine shop, 225 x 120 feet; power plant building, 156 x 56 feet; forge building, 100 x 50 feet; storehouse building, 60 x 60 feet; oil house building, 60 x 30 feet; laboratory building, 35 x 45 feet.

A number of brick houses and offices have been built, and it is the policy of the company to build an additional number in order to have their employees in close connection with the work; a large number of tenement houses also have been built to provide dwellings for the laborers needed on the plant.

The capacity of the plant is as follows, although it must be borne in mind that the different items will vary according to the conditions of the market, and that the output of each department can be increased or diminished as conditions may warrant.

Capacity Per Annum.

	Tons.
Rails	40,000
Beams and shapes.....	40,000
Billets and bars.....	10,000
Pig iron.....	30,000
Castings	8,000
Total.....	128,000

The mills are constructed to make a much larger product than above given, and, in fact, can take care of the product of four blast furnaces.

Blast Furnace.—The blast furnace is 18 x 80 feet, and equipped with four Massick & Crooke hot blast stoves 19 feet 6 inches by 75 feet; steam is supplied by six Babcock & Wilcox boilers in batteries of 680 horse-power each. The blowing engines are two pair, and are vertical, compound, condensing, built by the Wm. Tod Company of Youngstown, Ohio. The blowing cylinders are 84 x 60 inch stroke. The steam cylinders are 42 and 80 inch respectively. Arrangements are made to carry the molten metal direct to the open hearth furnaces; the estimated product of the furnace being 350 tons per day.

Steel Works.—There are three 35-ton open hearth furnaces, and room is provided for two 50-ton furnaces in addition. They are commanded by a 50-ton electric traveling crane, built by the Morgan Engineering Company of Alliance, Ohio. An electric charging machine is also provided to charge scrap and cold pig iron. Arrangements are also made by which molten pig iron can be charged direct from the blast furnace. It is intended to cast the product of the open hearth furnaces into molds standing upright on cars. The purpose of confining the product of the works to open hearth steel was that the market required such a range of material that it was thought that open hearth steel best fulfilled all the conditions, but in the plans room was provided so that

in case a Bessemer plant was desired, in order to supply the steel for a very large product of rails, it could be built without any disarrangement of the present plant.

Soaking Pits.—The product of the open hearth furnaces, after being poured into the molds, is carried to the soaking pits, where the molds are stripped by a hydraulic ingot stripper, and are placed in the pits by a Morgan electric charging crane, built by the Morgan Engineering Company of Alliance, Ohio. There are three soaking pit furnaces, of a capacity of 12 ingots each. The lids of the furnaces are moved by hydraulic power. After the ingots are thoroughly heated in the soaking pit they are taken out and placed on a tilting car, which delivers them to the table of the blooming mill.

Blooming Mill.—The blooming mill is two high, with rolls 40 inches in diameter by 103 inches in length, driven by a pair of 40 x 60 reversing engines built by the Wm. Tod Company of Youngstown, Ohio. The engines are geared one to two with cut steel gears. The top roll is moved by an engine placed on the top of the housings, which operates housing screws by means of cut worm and gear. The top roll and spindles are balanced by hydraulic pressure. The blooming mill is provided with tables on both sides and has two manipulators, which allow the turning and handling of the bloom. The tables are of such length as to permit the rolling of from 75 to 90 foot lengths.

Shear.—An extension of the blooming mill table on the catcher's side brings the product of the blooming mill to a powerful hydraulic shear, which is designed to cut blooms up to 200 square inches, or 20 x 10 inches. This shear is so designed that the water consumed will be according to the work performed. To cut small pieces, such as slabs for plate mill and billets for merchant mills, room is provided for a power shear.

Roughing Mill and Heating Furnaces.—From the shear the product goes either directly to the roughing mill or, if required to be heated, is sent to two Siemens reheating furnaces, where the blooms are charged and taken out by two Collins patent charging and drawing machines. These charging machines are operated by electric motors, and are built by the Morgan Engineering Company. The roughing mill is two high, with rolls 32 inches in diameter by 78 inches in length, driven by a pair of reversing engines, 36 x 48, built by the Wm. Tod Company of Youngstown, Ohio. These engines are geared five to seven with cut steel gears. The mill is built on the same plan as the blooming mill, and is provided with the same operating and balancing arrangement. Tables and manipulators are also provided for this mill. A portion of the product can be finished in this mill, but the bulk of the product will be sent to the finishing mill.

Finishing Mill.—This mill is three high, reversing, with rolls 28 inches in diameter and 66 inches long, and driven by a pair of reversing engines, 36 x 48, built by the Wm. Tod Company of Youngstown. The engines are geared one to one with cut steel gears. The mill has three stands of rolls. Movable tables run along the whole length of the train, and allow the bringing of the steel to or from any of the three sets of rolls. This arrangement allows a wide range of product, as any set will finish a piece. The front part of these tables operates on a hinge, to allow the piece being transferred from one pass to another. This mill will finish rails from 35 to 100 pounds per yard, and will finish beams and channels from 4 to 24 inches in height. It will roll zee bars, tees, angles, steel railroad ties, tie plates, squares and rounds; in short, this mill can roll any product, whose area is above 4 square inches. For the rolling of smaller material merchant mills are contemplated.

Hot Saw.—From the finishing mill the material is delivered to a runout, which brings it to a hot saw, where the product is cut to the desired lengths. A continuation of the runout brings the material to the cooling beds. In the case of rails these pass through a cambering machine before reaching the cooling beds. From the cooling beds the material is handled by drags, and is delivered to the straightening presses, shears, drills and such other machinery as may be required to put the material into marketable condition. All the finishing machinery is placed in a special building, and is operated from electric towers. After being finished, the material is

loaded directly into cars. For beams and shapes large beds are provided to cut and shape, as may be desired by architects and builders.

Traveling Cranes in Mill.—Each roll train is provided with an electric traveling crane, built by the Niles-Bement-Pond Company. They are designed to facilitate the handling of heavy parts and especially the changing of rolls. In the case of the finishing mill the crane is of 60 tons capacity, and is able to lift each stand of rolls, including the housings, and replace it by another stand. As the changing of rolls consumes usually from two to three hours, it is a costly operation. This feature, therefore, will be appreciated, as it reduces the time of changing rolls to from 15 to 20 minutes. In the case of the blooming and roughing mill 20-ton cranes are provided. They are sufficiently powerful to lift one roll at a time. As the changing of these rolls is not frequent, extreme expedition is not required. The output of the mills will be governed by the amount of steel delivered, but the capacity of these mills is such that they will roll the product of 12 open hearth or four blast furnaces. In case, therefore, that the market warrants it, all that will be required will be the extension of the open hearth and the blast furnace departments, which is allowed for in the layout of the plant.

Gas Producers.—To supply gas to the open hearth, soaking pit and reheating furnaces 16 10-foot Talbot producers have been provided, and connected by underground flues to the furnaces.

Foundry.—The foundry is located parallel to the mills, and is installed in a steel frame and brick construction building. It is 225 feet in length, the central span is 60 feet wide, with two bays of 30 feet each. It contains two cupolas 72 inches in diameter and one small cupola for melting brass and bronze. For melting special iron for strong castings an 18-ton air furnace is provided; four core ovens, and a complete equipment of machinery for mixing sand, cleaning castings, &c., is provided. Two electric traveling cranes, one of 30 tons and one of 15 tons capacity, built by the Niles-Bement-Pond Company, are provided. The capacity of the foundry is 30 tons per day, and is intended to do all classes of work, from the smallest castings to those weighing 30 tons or more.

Machine Shop.—The machine shop is located parallel to the mills, and is a building of steel frame and brick construction, and of the same dimensions, 225 feet, with 60-foot central span and two 30-foot bays. It is equipped with two Niles electric traveling cranes, one 30 and one 15 tons capacity. In equipping the machine shop great care has been taken to select the very best tools. Among such tools are one 96 x 96 inch Niles and one 54 x 54 inch Pond planer, one 84-inch Pond and one 51-inch Niles boring mill, one 18-inch Niles slotter, one 60-inch Niles, one 48-inch Niles and one 32-inch Pond engine lathe and two 40 inch and two 60 inch Frank-Kneeland roll lathes. In addition to these larger tools, the shop is equipped with a large number of small lathes, slotters, bolt cutters, pipe machines and a full equipment of machine shop appliances, with the exception of the roll lathes, each of which is driven by an independent electric motor. The tools are placed in groups, and each group is driven by a separate motor. A special part of the shop is partitioned off and serves as a tool room. Another part of the shop is at present used as a pattern shop, and is provided with wood working machinery, such as planer, circular saw, band saw, &c. The machine shop is not only intended to build machinery for the mills, but is also equipped to do any class of work that may be demanded by mines, smelting works, railroads and manufacturing establishments; in fact, any class of work from the heaviest steam engine to the most intricate machinery.

Forge.—The forge is a steel frame and brick work construction, 50 x 100 feet, and is in easy reach of the machine shop and foundry. It contains two steam hammers, one 700, one 1500 pounds each; also bolt, nut and rivet machinery and ten forges. It is also provided with the necessary heating furnaces. The power needed in the forge is supplied by a 25 horse-power General Electric motor.

Power Plant.—To furnish electric power to the travel-

ing cranes, tools and implements in the different mills and shops, a central power station has been erected. The building is steel frame and brick, 56 x 150 feet, and contains at present two Harrisburg tandem compound engines, 17 x 27 x 16 inch, directly connected each to a 150 kw. General Electric generator. Steam for the plant is provided by two Babcock & Wilcox boilers of 250 horsepower each. Room is provided to triplicate the power indicated as occasion may warrant.

The storehouse is a brick building, iron roof, 60 x 60, two stories. The oil house is also of brick with an iron roof. They are designed to keep supplies for the mills and under the supervision and control of competent storekeepers.

Water Supply.—The water supply is obtained from a large reservoir located northeast of the works, and is supplied from the same source as the city of Monterey. Through a sewer, the water is carried to a well near the blowing engine house of the blast furnace. Two powerful pumps of 2,500,000 gallons per day each lift the water to a stand pipe, from where it is distributed under pressure to the blast furnace and mills. The waste water from the blast furnace is carried back to the reservoir through an open ditch, and the large surface of the reservoir allows it to cool to the desired temperature for renewed use. To furnish the necessary pressure for the different hydraulic machinery a special pressure plant has been designed, and located between the roughing and finishing mills. Two hydraulic supply pressure pumps deliver the water into an accumulator under a pressure of 500 pounds per square inch, and thence it is distributed to the various hydraulic machinery. The waste from these machines is carried to a tank from which it can be used again. The waste water from the mills which cannot be used again is carried off through a sewage system.

Track System.—A terminal has been located, to and from which connection is made with all the railroads entering Monterey. Great care has been taken in arranging the track system in order to facilitate the delivery of the coal, coke and ore and for the shipment of the product of the works.

Extensions to Plant.—A structural shop for the building of bridges, buildings, &c., merchant mills, wire mill and plate mills are contemplated in the near future.

New Lake Boats.—The American Shipbuilding Company of Cleveland have closed contracts for two more vessels, making a total of 34 under contract for delivery in 1902. One of the vessels will be for the Pere Marquette Railway Company, and will be practically a duplicate of the car ferry built for them last year. The vessel will be 338 feet keel and 50 feet beam. She will have triple expansion engines with cylinders 20½, 36 and 58 inches with 36-inch stroke. Steam will be furnished by six boilers 13 feet in diameter and 12 feet long. The vessel will have a speed of 15 miles an hour and will cost about \$400,000. She will probably be built in the Globe yard, Cleveland, and will come out November 1, 1902. The other steamer will be a freighter, but the names of the purchasers have not been announced. She will be a duplicate of the steamers "Yosemite" and "Colonel" and will have the same power. She will be 376 feet over all, 366 feet keel, 50 feet beam and 28 feet deep. She will have triple expansion engines and Scotch boilers. The vessel will be built at South Chicago and will come out in August, 1902. She will cost \$250,000.

E. H. Bankard, purchasing agent of the Baltimore & Ohio Railroad Company, Baltimore, Md., advises us that bids will be received within a few days for 4000 steel hoppers, 1300 box cars, 700 flat cars, 25 passenger coaches, 11 baggage cars, 60 feet long; 1 combination coach and baggage, 60 feet long; 1 baggage and mail, 60 feet long; 48 consolidation engines and two 4-wheel shifters.

Pittsburgh, by reason of its great number of blast furnaces, rolling mills and steel works, is the largest consumer of fire brick of any city in the world. Four counties of Pennsylvania produce the greatest part of fire brick used, these being Clearfield, Cambria, Clarion and Clinton counties.

The Iron Age

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Proposed Currency Legislation.

The discussions which have been aroused by the proposals of Secretary Gage for the amendment of currency legislation have all been extremely friendly to the purposes he aims at, and to the measures he proposes, if more decisive ones are impracticable, but there is some disposition to feel that the compromises he proposes are hardly practicable, or would encounter as much opposition as more radical measures would, with the difference that radical measures would be permanent, while the measures he proposes are avowedly tentative.

His proposal for a federation of banks is designed to accomplish the benefits of the branch system without encountering the popular opposition that branch banking would meet in many States. Bankers, however, have not received this proposal with much cordiality; it is quite an unknown measure, and it is too suggestive of increased liabilities without increased control. Besides, in New York and other financial centers, the banks have learned to pool their resources for the support of each other and their solvent customers. The merit of branch banking is not so much the additional strength acquired as the additional facilities for accumulating capital in one part of the country and lending it in another. For example, it is clearly due to the branch banking system that there is so little difference between the rates of interest in the remote and agricultural districts of Canada and the commercial centers. In the United States, without the branch system, rates may be very high in Arkansas and Colorado and very low in New York and Boston. This very fact arrays the local bankers of the West and South in opposition to branch banking; it means the competition of the great financial institutions of the great cities and lower rates of interest. But the main difficulty in establishing branch banking is the dread which the people of a great part of the country entertain of large combinations of capital. This sentiment would be aroused by a federation of banks even more than by the establishment in the West and South of branches of New York and Chicago banks.

Securing a bank circulation on the deposit of Government bonds will have to be given up. Banks in New York and Chicago are surrendering their circulation in order to sell their loans at present prices. The profit in a circulation so secured is small and must grow smaller as investments of absolute security rise in price and as the surplus revenue is employed in reducing the public debt. Secretary Gage's proposition is to allow a bank circulation secured as to one-half by a deposit and as to the other half by the general assets of the bank. If this were adopted it would be necessary to enact a new law on the subject in a few years, and the question is whether it would not be better to hold out for a comprehensive scheme of bank currency secured by a first lien on the assets, even if the change in security were to be effected gradually, say 20 per cent. a year, as was proposed by a bill in the last Congress. Such a measure could probably not be obtained at this session, but when obtained it would be a finality.

Ultimately the greenbacks will have to be retired. All the best financial authorities are convinced that the retirement cannot begin too soon; that it would have been economy had they been retired years ago, and that the Treasury ought to get out of the banking business and no longer be obliged to carry a huge gold reserve, provide the gold for export and maintain the credit currency of the country. Secretary Gage proposes to accomplish this gradually and by indirection, allowing the security deposited for \$100 in bank notes to consist of \$30 in bonds and \$20 in greenbacks. But the persons who are opposed to notes based on general assets will not accept a circulation based one-half on general assets, and those who are opposed to retiring the greenbacks and substituting bank notes for Government paper would fight the proposal of the Secretary as well as to the more aggressive and decisive process of burning one-fifth of the greenbacks every year.

It is quite clear that a larger volume and a more elastic quality of the bank circulation is necessary, and that the greenbacks can be retired only as a part of a bank circulation plan. It is also clear that any measure of currency reform will encounter some opposition, and that public sentiment in favor of thorough currency reform is much stronger than the gentlemen in politics believe. The act of March 14, 1900, was passed by Congress in response to the repeated and imperative demands of enlightened public sentiment, and it proved to be a judicious measure politically. Public sentiment would go much further than politicians believe in supporting measures to perfect the establishment of the single gold standard, beginning the retirement of the Government paper and providing a larger and more elastic bank currency and the better credit facilities which branch banking would afford.

Sentiment and Statistics.

While copper has continued to parade upon the stage of public interest, making further unenviable records, and greeted with hisses of derision from the victims of speculation and from the public alike, it is with a sense of relief that attention has been diverted somewhat from copper by the dramatic scenes enacted in the important produce markets, more especially in cotton and wheat.

The cotton world had been eagerly awaiting the Government preliminary estimate of the 1901-02 crop. It was prepared for a report more in harmony with the advices from the growing sections than were the various estimates made by a majority of the recognized trade authorities, which encouraged a belief in a crop ranging from 10,500,000 to 11,250,000 bales. But the figures of the Agricultural Department—9,674,000 bales—when announced, took the cotton industry and the public completely by surprise, and, for a moment, prevented a realization of the full significance of the estimate. Then came an exhibition of excitement and enthusiasm on the local exchange seldom witnessed, except at times of panics and of corners. Prices rose sharply and rapidly, of course, reaching about \$3 per bale. While profit taking and attempts to discredit the Government report caused some reaction on subsequent days the inspiration remained with the trade, maintaining the higher level of the market.

It is notable that the statistical position of cotton had favored higher prices for some time, but the dominant minds in the trade succeeded in belittling the tardy movement of the crop by attributing it to the car famine, to farmers holding back for higher prices and what not; while large crop estimates were used as depress-

ing factors. There were some trade estimates made of 10,000,000 bales and less, but these were not allowed to be taken seriously.

The Government shows that there has been an abandonment of over 730,000 acres in the area of cotton planted, leaving a little over 26,800,000 acres to be picked. It is of significance, too, that the average net weight of bales is light, 468.2 pounds, throughout the entire cotton belt—the lowest average in ten years.

The average annual consumption of American cotton for the past three years has been 10,500,000 bales. The crop last year was 10,384,000 bales, and for the preceding year 9,450,000 bales; accepting the Government estimate of 9,674,000 bales for 1901-02, we have a total production of 29,508,000 bales for three years, while the requirements of the world's spinners for the same time are, or will be, 31,500,000 bales.

For the moment the speculative temperament of the market and the statistical forces are working in unison in molding prices of cotton, resulting from the readjustment of sentiment and facts through the operation of the Government balance wheel.

In the grain markets, more especially in wheat, sentiment and statistics have been used as motive power by turns, since the opening of the month of December. The public, becoming imbued with the idea that wheat is cheap around 75 cents, have entered the market without reserve. Everything offered has been taken, and prices have advanced rapidly to new high records amid the greatest excitement. In fact, with nearly all short interest eliminated, the "lamb" have wrested control of speculative dealings from the professional operators.

The opinion seems to prevail that with corn and oats very high, and wheat being fed to stock to a much greater extent than has been currently believed heretofore, all the available wheat will be required before the new crop is marketed. Exports for the season—that is, from July 1 to December 1—have been 132,000,000 bushels, including flour, which are enormous, being 51,000,000 bushels in excess of the corresponding time last year. In the Southwest, too, in the winter wheat belt, there has been much dry weather, which has encouraged the belief that much higher prices are allowable for the old crop of wheat.

While it seems probable that the 1901 wheat crop will all go into consumption and the world's surplus reserves be drawn upon, the general position being a very strong one, there is imminent danger of pushing the present advancing movement too far in the heat of the moment.

It is well to recognize that the growing crop outlook, although not especially encouraging, is by no means a bad one, and it is too early in the season to excite alarm as to the outcome, and, while the movement of winter wheat is very moderate the receipts of spring wheat at primary points are liberal. Indeed, there was a remarkable increase in the visible supply of wheat during November—over 21,000,000 bushels—against an increase of less than 4,500,000 bushels during November last year, and about 7,000,000 bushels in November, 1899. In 1896 the wheat visible supply decreased 618,000 bushels in November. Thus far in the cereal year the increase in the visible supply is nearly 50,500,000 bushels. While exports are liberal they are the largest at present from the Pacific Coast, where lower prices prevail than east of the Rocky Mountains. The surplus in Manitoba and in the Canadian Northwest, too, is estimated at 50,000,000 bushels, and holders there are underselling American dealers. There is danger in pushing the advance to the extreme, and from the very nature of the specu-

tion, which leads to "pyramiding," breaks in prices are anticipated.

It is curious to note how much sentiment controls and how little statistics govern speculative movements. Reason comes afoot, but imagination rides at a gallop. Of course, facts are not entirely ignored, they are nearly always found at the foundation of market movements, but are too often perverted or subordinated to what the future may or may not hold in store. The cash or spot markets are more conservative, and adhere more closely to facts, while future dealings fluctuate with the rise and fall of ideas, not less real than material facts, but less tangible and often more powerful.

The Western Scrap Situation.

Attention has for some little time been directed to the peculiar conditions existing in the Western scrap trade. Information has occasionally found its way into the trade reports relative to a conflict of interests between the rolling mills manufacturing bar iron and the dealers who form so considerable a factor in collecting scrap and supplying it to the mills. Ordinarily the supply of scrap is sufficiently large to meet the requirements of the mills, and the prices made are so governed by the natural law of supply and demand that the manufacturers of bar iron are able to secure a satisfactory profit on their operations. For several months, however, the available quantity of certain classes of old material has been comparatively limited, owing to the operation of special causes. The mills, for instance, use considerable quantities of borings, turnings and small pieces of wrought scrap suitable for busheling purposes. The strike in the Western machine shops cut off for a time a great part of the usual supply of borings and turnings coming on the market and caused the price of this class of material to be advanced out of proportion to the value of other grades of old material and also seriously out of line with the prices received for the finished product. This at the same time caused an increased demand for busheling scrap, and the price of that class of material has been advanced, the bar iron manufacturers claim, very much out of line with the prices of railroad wrought scrap and other of the higher grades of mill material.

The mill owners found that the cost of their material was advanced so considerably on this account that even at the recent advanced prices received for bar iron their profits were either quite nominal or were wholly wiped out. They are, therefore, attempting to correct this condition of affairs and are seeking to secure such control of the scrap trade as will enable them to establish a more reasonable rate for these standard materials. It is claimed that no hostility is developing to dealers as a class, notwithstanding the intimations which have been given in some directions that the mill owners would be pleased to see the dealers eliminated. The fact is recognized that scrap dealers constitute an important element in gathering and furnishing supplies of material to the mills. At the same time the situation has grown so burdensome that it seemed to require concerted action on the part of the mills to secure more reasonable rates.

The outcome of the contention now being conducted will, of course, depend on the condition of the supply of scrap iron in the future. It is believed that the quantity now coming from the railroad companies will increase, as they are generally overhauling their equipment and relegating a great deal of it to the scrap heap. The closing in of winter will, of course, check the accu-

mulation of track scrap, but this constitutes only a small proportion of the scrap consumed in the bar iron mills. It has been found desirable by many of the mills to increase the quantity of puddled iron used in piling, and quite a movement is seen in the erection of additional puddling furnaces in which cast scrap or pig iron can be used. The more cast scrap thus used the less busheling scrap will be required. As all manufacturing establishments are now actively at work and no strikes are interfering with their regular operation, the production of standard grades of scrap is believed to be proceeding on such a scale that the supply will hereafter be adequate. Further, the season being at hand when specifications for bars are not so heavy as at other portions of the year, it is expected that the demand for scrap will be lighter than during the fall months and that the situation will thus be such as to enable the desired adjustment of prices to be made.

The steel scrap trade is not presenting such problems as the trade in scrap iron. The steel works are steadily purchasing supplies of the material which they require, and owing to the great activity in steel products and the excellent prices now ruling, no friction has developed over the cost of this class of material.

Importations of Soft Steel.

No more amazing and sudden change has come over an industry, from an international point of view, than has occurred in the steel trade in the last year. In 1900 the United States shipped abroad in very considerable quantities steel blooms, billets, sheet bars and other forms of crude steel. Now, toward the close of 1901, quite a number of moderate sized lots of steel billets have been ordered for importation into this country, in spite of the duty of \$6.72 per gross ton. The steel is not to be used for export work, so that 90 per cent. of the duty is refunded, but for actual home consumption. It is a fact, too, that foreign steel has been sold as far inland as the Chicago district, so that not alone the duty, but also quite a heavy transportation charge, must be added.

It should be stated, however, that the volume of this current has not been large, nor is there any likelihood whatever that the tonnage will be heavy. The business can only be done under special circumstances, which restrict it. There must be prompt delivery. Ocean freights must be low. The necessities of foreign makers must be urgent. In fact, there is reason to believe that the steel sold is on old contracts made in Europe with local consumers who will not take the metal, but who will be forced in many instances to pay the difference between the contract price and the actual selling price, so that they stand the loss. It is a fact, too, that the sales here are largely confined to small sizes, which are particularly scarce in this country. Furthermore, there is reason to believe that American rolling mills have taken advantage of the offers of foreign steel to secure from the American steel works which usually supply them assurances of a prompt supply, which they had no other means of commanding.

In itself, therefore, the importation of foreign steel billets for actual consumption in the United States is not a movement of any great importance. It is, however, a very significant and interesting illustration of the complete change which has been wrought in a very brief time, which has carried us to the very crest of an extraordinary prosperity, while European makers, and notably those of Germany, are floundering in the depths of a fearful depression. It is further and very eloquent

proof that for some time to come we cannot hope to do any export trade in the crude forms of steel and in the finished products which lie nearest to them.

A British-American Rail Pool.

The *London Iron and Coal Trades Review* discusses the chances of a British-American rail pool in the following words:

It appears to be probable that the time is not far distant when the steel manufacturers of Great Britain and the United States will be likely to consider the expediency of pooling the outside business of the world in several of the greatest branches of that industry. British manufacturers can hardly lose anything by keeping this possibility before their minds and preparing themselves to deal with it. The world's annual requirements in steel rails, to quote a notable example of possible pooling, may be taken at 5,500,000 tons, of which 2,500,000 tons may be taken as the annual consumption of the United States, leaving 3,000,000 tons for other countries. But the steel rail capacity of the United States is probably not less than 4,000,000 tons a year, and it is being extended very materially by the new plants now being put down at Birmingham, Ala.; Sharon, Lackawanna and elsewhere. British rail mill capacity has not been increased to any extent worth speaking of for many years, and is not likely to be added to in the near future. Germany, the only other country that produces rails for export to any extent, is not nearly so serious a competitor in outside markets as the United States, which must by and by find an outlet for a surplus of 1,500,000 tons a year at the least if they keep their mills anything like fully employed. All the conditions appear to favor the idea of an Anglo-American agreement as to pooling the outside markets of the world. In the absence of some such agreement there is reason to fear that, when depression again prevails in both countries, prices will be liable to be cut to a point that will leave no profit on outside orders for either country. To the United States this would hardly be a very serious matter, because they can make their own prices in their home markets, which can always be depended on to absorb two-thirds of the total home supply. To the United Kingdom, which has no such resort, unrestricted competition may lead to disaster. We have no assurance that we shall be able to reserve even our home markets. But those markets at the best do not absorb more than 300,000 tons of rails a year.

The very serious defect in this presentation of the subject is that the United States is far from having a steel rail capacity approaching 4,000,000 tons. In 1900 our mills made the maximum output of 2,385,682 tons, being crowded the whole year. This year's production is not yet known, but it is pretty certain that it will not go much above 2,600,000 tons, in spite of the fact that the pressure to meet the requirements has been unprecedented, and that a considerable tonnage must be carried into next year. Of course, improvements have been made and new mills are to start next year, but it will be physically impossible to make more than 3,000,000 tons next year, if, in fact, that total is reached even in 1903. One fact, too, must not be overlooked, and that is that some of the plants rated as rail mills produce billets also, and that for some time to come they cannot be diverted entirely from that trade. With foreign rails being offered at £5, c.i.f. New York, as against \$28 at mill for the home market, our European friends need not worry over any severe competition from this country during the year 1902.

Pumping Engines for Chicago.—The Public Works Department of the city of Chicago opened bids on the 6th inst. for four pumping engines with a capacity of 300,000 gallons a minute, to be used in pumping the contents of the Thirty-ninth street intercepting sewer into the conduit leading into the drainage canal. The Camden Iron Works bid \$119,911 for the four engines, and the Allis-Chalmers Company \$120,000. These were the only bidders. The figures named are 15 per cent. under the estimated cost.

Marconi, the inventor of wireless telegraphy, is about to conduct a series of experiments in wireless telegraphy in the fog bound regions around Cape Race, Newfoundland. If the experiment succeeds the Government of Newfoundland proposes to install the wireless system of telegraphy along the coast of Labrador next summer.

Notes from Great Britain.

Standardization in Great Britain.

One of the effects upon the British iron and steel trade of American competition has been a close inquiry into the subject of standards. It is doubtless within the knowledge of your readers that a Standards Committee is at the present time sitting and taking evidence. This committee is composed of James Mansergh, late president of the Institute of Civil Engineers; Sir Benjamin Baker, Sir John Wolfe-Barry, Sir Frederick Bramwell, Sir Douglas Fox, G. Ainsworth, William Dean, A. Denny, J. Allen McDonald, E. Windsor Richards, James Riley, Prof. W. C. Unwin and Dr. J. H. T. Tudsbury. It is the outcome of a suggestion made by Sir J. Wolfe-Barry, before the Institution of Civil Engineers, and the expenses of the inquiry are being equally borne by that institution, together with the Institution of Mechanical Engineers, the Institution of Naval Architects and the Iron and Steel Institute. I know that there is an impression abroad that the Englishman is far too individual in his instincts and methods ever to agree to standardization as a general policy. It must be borne in mind, however, that standardization was started in this country by Whitworth, in the matter of screw threads and standard gauges for all engineering work. Since then we have stood still while America and Germany have both enormously simplified their standard sections. The result is that now in England 171 different sections are rolled in English mills, as compared with 67 standard sections in Germany and 49 in America. Nor is this all. In rails, for each weight of rail with given general outside dimensions, there is practically a different shape of section for each railway in the country. There are 70 different sections of tramway rails. Another point which is now being pressed home upon British iron and steel men is the variety of tests required. There is, of course, no objection to any number of tests if they do not involve serious variations in manufacture—variations which are needless, and in consequence entail needless expenditure. But the tests in England do involve this. There is the Admiralty series of tests, the Board of Trade tests, Lloyd's tests and a number of other minor society tests. Obviously the results are far reaching. Thus, in the evidence cited before the committee, a leading director of an Indian railway says:

"The existing chaos in Indian locomotives is marvellous. I have exact details of three good engines of identical type, power, weight, purpose, which in details differ from each other in almost every respect, necessitating new drawings, new patterns, new templates, at an extra cost of £2000, all from the same office and all from the same builder. I have a tabular list of the test specifications of different railways. It would be an exaggeration to say no two tests are alike, but it is not much of an exaggeration."

An agent in his evidence said: "We have made hundreds of rolls, and speaking from the experience of 25 years, eight-tenths of the rolls we have cut have never been heard of again, and thousands of pounds have gone for the want of a standard. I know of works in Scotland spending £50,000 in rolls just now. They may be right or may be wrong with a lot of their sections, but they are doing it. Lately, for the sake of an Indian order, we had to supply channels 10 x 2¼ inches, and the only way we can get them is to take 10 x 3 inches and plane them down; that is a most expensive matter. We had a case where we had to plane a square bar of 3½ inches square section into an angle bar of 3½ x 2 x ¾ inches, and it had to be planed out of the solid. This was not to replace old work, but was for a new order and new design." The same agent compared this with a recent experience of his in America. He states that on an inquiry he had last year for 1500 tons 83-pound steel flanged rails, 800 tons of steel sole plates to suit them, and 66 tons of fish plates, the Illinois Steel Company wrote: "We can only quote upon our standard specifications in practice for this small lot." The lot in question amounted to 2366 tons.

Another witness states: "I had to supply a quantity

of material for a bridge to be built in one of our English colonies. Included was a shape which had never been rolled. The quantities were so small and the lengths so short that they were probably stiffening pieces, but it was insisted upon by the export merchant here that I should supply the exact section. They were angle irons. The average cost of material throughout the bridge was £8 10s. per ton. I made large pieces of angle iron by means of a blacksmith at a cost of £28 or £30 per ton."

With evidence like this before it it is not surprising that the committee is not only busy elaborating standard sections, but proposes further to constitute a permanent Standards Committee, before which from time to time evidence may be laid as to the need for any modification or addition to the standards finally adopted. Of course there are difficulties in the way. Not the least is to induce the Admiralty, the India Office and the Colonial Office to adopt the recommendations of this committee. In other words, the official world must "stand in." If this can be done success is assured.

Standardization of Metals.

Not only is the question of standardization being taken up for the rolling mills, but also for metals. Year by year the difficulty gets greater of meeting specifications. Mechanical tests do not agree with the chemical tests, and are often incompatible with one another. The Walsall Chamber of Commerce has now invited the Wolverhampton, Sheffield, Middlesbrough and Birmingham chambers to co-operate in some attempt to formulate a scheme for standardizing metals. Anybody whose business it is to follow market quotations will at once realize the importance of this movement.

Activity Maintained.

Judging by the ascertainment of the auditor for the North of England and Cleveland district, it would seem there has been some slight improvement in the matter of production. For the months of September and October the amount produced was 17,759 tons in the representative houses. Of this 130 tons was rails, 4198 tons plates, 10,703 tons bars, 2727 tons angles, the net average price being £6 10s. 3.20d. This return shows an increase in output of 1617 tons in excess of the previous return, but the price shows a reduction of 3 shillings per ton in rails and 6 shillings 6 pence in plates. Bars improved 1 shilling and angles 1 shilling 2 pence. The price, however, shows marked reduction, the corresponding figure being £8 5s. 11d. The price above quoted, £6 10s. 3d., shows a decline on the year of £1 15s. 8d. Although this seems a very heavy decline, it is worth knowing that it is still £1 16s. 2d. per ton above the 1895 rates. The auditor's report is also to hand of the Midland iron and steel wages board. The returns show some similarity to the North of England. From the 12 selected firms the net average selling price for September and October were £6 10s. 0.88d. per ton. The different classes of iron sales and the average selling prices are as follows:

	Tons.	£ s. d.
Bars	19,524	6 10 8.75
Angles and tees.....	1,198	6 14 6.69
Plates and sheets.....	1,891	7 17 5.03
Hoops, strip and miscellaneous.....	6,695	6 11 3.89

The total quantity produced is 29,310 tons, which is an increase of 4984 tons, while the selling price shows an increase of 1 shilling .40 pence. In accordance with the sliding scale wages remain unaltered at 8 shillings 6 pence per ton for puddlers until February 1 next.

The Markets.

The market remains very much as I have indicated in previous dispatches. The Germans are still the *bête noir*. In practically every line of iron and steel they are undercutting the market—steel plates, thin sheets, billets, blooms, slabs, pig iron, joists, it is all one to them. As I have pointed out before, they must unload, for they want the money. In iron the importation of Canadian pig iron is depressing prices and checking business. Makers of Scotch steel are now gladly accepting £6 per ton, less 5 per cent., and considerably less for a good specification. Boiler plates are selling easily for £7, less 5 per cent., compared to £7 15s. three months ago. In

fact, although activity is still maintained in the mills orders are hard to find, and the prospect after Christmas is distinctly gloomy.

I imagine that the business aspect is to a large extent the cost of the present dissatisfaction spreading all over England at the conduct of the South African war. In every department a sense of fearful depression is creeping over us, while the war seems to come no nearer to its end and the expenditure in no way decreases. It is curious how business men require practical demonstration of the plain truth that war, under no circumstances, can possibly be good for trade. I believe that if the full expense of the war at the present moment were totaled up, it would be equal to at least \$2,000,000,000. No matter how wealthy a nation may be, it is impossible for it to go on spending money like this and not more or less comparatively impoverish itself.

The Trade Depression in Germany.

Apropos of Germany, a gentleman who has just returned from there has been analyzing the situation. The reasons he ascribes may be thus briefly summarized:

1. The general growth of expenditure of national savings of military and naval establishments are now accentuated by the Chinese trouble. Prior to the Chinese expedition the industrial section of Germany had already been screwed up to maximum point, not merely by taxation, but by a terribly severe system of conscription. The expenditure on the Chinese expedition was accompanied by a large increase of expenditure on the navy. The German Government cannot retrench, while the revenue falls with the decline of commerce, with a consequent deficit.

2. Pressure of the landed proprietors upon the Government to bring about changes in the tariff. Commercial Germany has become apprehensive, and trade has accordingly been paralysed.

3. Overspeculation. The expansion of German trade during the past few years led to rash flotations of industrial companies in 1898 and 1899. This, accompanied as it has been by trade activity on an insecure basis of capital, has led to the inevitable smash. In practice it has been discovered that although German travelers have opened up trade in various quarters of the globe they have been so persistently followed up by American and English traders that no remunerative returns have accrued.

4. The South African war is as much a serious misfortune to the German trader as to the British Empire. The enormous demand for both coal and gold for war purposes led to a stiffening of prices, with the result that German capacity to purchase was seriously contracted. Another striking instance of the far-reaching depressing effects induced by war expenditure.

The Talbot Process.

In the law courts this week has been tried an interesting case in which a shareholder in the Talbot Continuous Process Company, Limited, brought action to rescind a contract to take shares in the defendant company on the usual grounds of misrepresentation in and concealment from the prospectus. The plaintiff claimed that the nature of the invention was misrepresented in the prospectus; 2, that the position of the company with regard to licenses was misstated in the prospectus; 3, that with regard to these licenses the annual income to be derived therefrom was grossly exaggerated in the prospectus; 4, that the relations of the company to the vender and the vender's relations to the patentee were not accurately stated, and 5, that the prospectus by implication represented that the patents were valid patents and that the defendants had been so advised by counsel. The company denied that there was any misrepresentation or concealment in the prospectus. The case for the plaintiff entirely broke down in cross examination, and under these circumstances the action was dismissed.

S. G. H.

A report on the British tin plate trade by S. Burrell Prior of London, states that the wave of prosperity which has visited the trade during the last two years is

now on the ebb. The works which have been restarted in South Wales have caused the supply to outstrip the demand, and although it is difficult to obtain plates for prompt delivery, prices for January and onward are considerably lower. Until the end of the year, the Welsh tin plate works in general are pretty well engaged and several are full to the end of January, but the majority of buyers are holding off.

The Pennsylvania Steel Company.

In their application for listing the \$16,500,000 7 per cent. noncumulative preferred and \$10,750,000 common stocks of the newly reorganized Pennsylvania Steel Company, who were organized under the laws of New Jersey, the following balance sheet and profit and loss accounts are given:

Pennsylvania Steel Company (New Jersey).

Balance sheet as of October 25, 1901.

ASSETS.	
Cash	\$651,558
Notes receivable.....	100,000
Stocks and bonds.....	27,027,873
Total.....	\$27,779,432
LIABILITIES.	
Capital stock, preferred.....	\$16,451,900
Capital stock, common.....	10,744,000
Surplus	583,532
Total.....	\$27,779,432
Profit and loss account to October 25, 1901.	
Expense.....\$18,083	Dividends and interest.\$601,615
Net profit.....583,532	
	\$601,615

The total authorized capital is \$50,000,000, half of which is preferred. Of this amount \$10,750,000 common and \$16,500,000 preferred is outstanding, issued for \$9,000,000 cash and \$1,500,000 preferred and \$5,000,000 common stock of the Pennsylvania Steel Company of Pennsylvania.

The preferred stock is limited absolutely to 7 per cent. per annum, noncumulative, and is preferred as to assets in the event of liquidation.

The common stock is entitled to such dividends as the directors may declare out of the surplus earnings after there shall have been set aside a sum sufficient to pay the full dividends on the preferred stock in any fiscal year.

The Pennsylvania Steel Company (New Jersey) have no bonded debt, but the subsidiary companies have bonded indebtedness as follows:

Pennsylvania Steel Company (Pennsylvania), 5s.....	\$1,000,000
Maryland Steel (\$85,000 owned by Pennsylvania Steel), 5s.....	2,000,000
Pennsylvania Steel and Maryland Steel (\$518,000 owned by Pennsylvania Steel), consol. 5s.....	4,000,000
Spanish-American Iron Company (all owned by Pennsylvania Steel), deb. 5s.....	217,000
Cuban Steel Ore Company (\$440,000 owned by Pennsylvania Steel Company), 6s.....	750,000

The Pennsylvania Steel Company (New Jersey), although at present exclusively a stockholding company, are authorized to manufacture iron, steel and other metals, and do anything directly or indirectly connected with any mining or manufacturing business.

The company own the following securities:

Shares owned.	Total issue.
49,818 shares Pennsylvania Steel (Pa.), common.	50,000 shares.
14,976 " Pennsylvania Steel (Pa.), preferred	15,000 "
10,000 " Maryland Steel.....	10,000 "
240,000 " Spanish-American Iron Company.....	240,000 "
6,975 " Juragua Iron Company.....	13,950 "
3,000 " Baltimore & Sparrow's Point Railway	3,000 "
34,790 " Cuban Steel Ore, preferred.....	100,000 "
34,790 " Cuban Steel Ore, common.....	200,000 "
\$85,000 Maryland Steel 5s.....	\$2,000,000
\$518,000 Pennsylvania Steel and Maryland Steel 6s..	\$4,000,000
\$217,000 Spanish-American 6s.....	\$217,000

The Pennsylvania Steel Company (Pennsylvania) own 555 acres of land at Steelton, Pa., in which is located their steel plant, composed of five blast furnaces, with an annual capacity of about 300,000 tons; Bessemer plant, capacity 300,000 tons ingots; open hearth plant, 14 furnaces, capacity 250,000 tons ingots; slabbing mill; two blooming mills; rail mill, capacity 240,000 tons of rails; merchant mill, steel foundry and large frog and switch shop, and a modern bridge shop.

The Maryland Steel Company own 1000 acres of land at Sparrow's Point, Md. Their plant is equipped with four blast furnaces, annual capacity of about 450,000 tons of pig iron; Bessemer plant, capacity 500,000 tons ingots; blooming mill; rail mill, capacity 400,000 tons of rails; a 5-mile railway and a modern shipbuilding plant.

The Spanish-American Iron Company own large ore properties and railroad, in Province of Santiago, Cuba.

Juragua Iron Company, Limited, own large ore properties and railroad in the Province of Santiago, Cuba.

Cuban Steel Ore Company own large ore properties and railroad in Cuba. The property is being developed and beginning to make shipments of ore.

The New Sheet Mill of Laughlin Nail Company.

The Laughlin Nail Company of Wheeling, W. Va., have recently finished and put in operation a very complete sheet mill plant, located at Martin's Ferry, Ohio. Active work on the erection of the plant was started last January. The mill is located just south of the large cut nail mill and shovel works of the Laughlin Nail Company, and at right angles to the tracks of the Cleveland & Pittsburgh Railroad. There is one main building, which contains the hot mills, and which is 60 feet in the clear and 286 feet long. On one side it has a lean-to 30 x 242 feet and another 30 x 286 feet. There are also three producer houses, each 44 x 27 feet, and boiler house 35 x 66 feet. The main building is of steel construction and is commanded by a 20-ton three-motor electric traveling crane, built by Pawling & Harnischfeger of Milwaukee, Wis. The equipment consists of two stands of roughing rolls, 26 x 44 inches, and four stands of hot mills, two of which are 26 x 44 inches and the other two 26 x 38 inches. There are also two stands of cold mills, 26 x 44 inches.

These mills are driven by two 32 x 72 inch Corliss engines, direct connected to rolls, and built by C. & G. Cooper Company of Mount Vernon, Ohio. Steam is furnished by two batteries of Sterling boilers, consisting of two boilers to the battery, of 258 horse-power each, giving a total steam capacity of 1032 horse-power. Steam is taken from these boilers through 6-inch expansion U bends to a 16-inch header. From there the steam is taken down through a 12-inch main steam line through a tunnel and to the engine through a 36-inch Austin receiver separator. It enters the engine under the floor, giving a clear floor space around the engines, there being no overhead pipes to interfere with the operation of the crane. The boilers are hand fired, coal being delivered by gravity railway from mines owned by the company. The ashes drop through the floor to an underground car and are taken to the river bank.

The electric plant consists of two 90 horse-power Harrisburg standard engines, direct connected to two Westinghouse generators. Switchboard consists of one Westinghouse black enameled board, containing two generator panels and two feeder panels. The machines are arranged to operate in multiple, in case any excess load is required over one machine.

The company receive slabs weighing from 350 to 550 pounds, 7½ inches wide, which are reheated in their own large plate mill, being given five passes in the roughing mill and one pass in the finishing mill. After being sheared by an automatic driven shear the bars are loaded into trucks and taken to the heating furnaces in the sheet mill. The bars are picked up by crane, taken to pair furnaces and are then handled by the mill crew; after being heated they are then taken to roughing mill for two passes, then to finishing mills, where they are finished. After being sheared the packs are opened and then taken to the cold rolls and cold rolled. The sheets are then picked up by a crane and taken to the annealing floor, where the pack is charged on annealed bottoms, annealed, and, after doing this, again picked up by the crane and placed on tracks, then delivered to the galvanizing, corrugating and metal ceiling departments. In case the black sheets are to be sold in the open market they are delivered direct to the car, a track having been placed in the mill for this purpose.

Particular attention is paid by the Laughlin Nail Company to the annealing of their sheets, as the firm believe that only by proper annealing can the best quality of sheets be obtained. The annealing furnaces were built by William Swindell & Brothers of Pittsburgh and are fired by producer gas. The furnaces are charged by a special device invented by H. A. Strauss, engineer, of Wheeling, who designed and built the sheet plant complete. The sheet and pair furnaces, six double Swindell patent water seal gas producers, 10 feet in diameter, were built by William Swindell & Brothers, the well-known engineers and contractors, of Pittsburgh.

While it is possible the Laughlin Nail Company will market black sheets occasionally, it is the intention of the firm to market practically their entire product in galvanized, corrugated and crimped sheets, corrugated roofing, pressed standing seam and rolled roofing, weather board and brick siding conductor pipe, eave trough and steel ceilings. The firm have installed complete equipment, consisting of the latest machinery, and have also built galvanizing pots on entirely new lines. Two warehouses have been provided for the accommodation of the black sheets, one adjoining the pickling room, for galvanizing, the other adjoining the paint mills.

Special attention has been given to the artistic appearance of the steel ceilings which the concern are making. A distinct departure has been made by the firm in the decorative quality of their steel ceilings. The concern have adopted a lapping joint, which is entirely new and which conceals the sheared edges of the plates, requiring no swedging and only sufficient nailing to hold the pieces up. The concern are already in receipt of quite a number of orders for their new designs for steel ceilings, which they are now executing.

The entire plant has ample shipping facilities, having direct connection with the Baltimore & Ohio, Wheeling & Lake Erie, Cleveland, Loraine & Wheeling, the Wheeling Terminal and the Cleveland & Pittsburgh roads. The company control river frontage, giving the advantage of river shipments. Taken as a whole this new sheet plant, with galvanizing, roofing and ceiling departments, is of modern equipment throughout and is certain to produce a maximum output of product. The first sheets were rolled in the new mill in October and the plant has been in successful operation right along since that time. While only four hot mills have been installed, provision has been made in every way for two additional mills, which will be built within a short time. The output of black sheets will be from 40 to 50 tons a day, practically all of which will be used in the roofing, ceiling and siding departments.

The officers of the Laughlin Nail Company are W. L. Glesner, president, and F. K. Dixon, secretary. The roofing and ceiling departments are under the direct supervision of J. K. Davies, the sheet mill by John Usher, and the galvanizing and corrugating departments by W. Bates Woods, who also designed and built the corrugating and galvanizing works.

The first annual convention of the blast furnace workers in session in Youngstown, Ohio, was concluded last week. The officers of the union elected are as follows: James McMahon of Struthers, president; Michael McGlynn of Struthers, first vice-president; W. J. Clark of Buffalo, second vice-president; Bert Gershel of Columbus, third vice-president; G. H. Vanmeter of South Pittsburg, Tenn., fourth vice-president; G. L. Mullen of Lowellville, secretary, and Thomas McGlurkin of Girard, treasurer. The national trustees are Allen Matthews of Lowellville, James Tighe, Jr., of Brier Hill and Joseph Zeller of Girard. The headquarters of the organization will be in Youngstown.

At a conference held in Youngstown, Ohio, last week between representatives of the American Steel Hoop Company, the Republic Iron & Steel Company and John F. Ward of the Amalgamated Association, it was decided not to make any changes in the guide mill scale.

A Moderate Increase in Pig Iron Production.

Stocks of Coke and Anthracite Iron Decline 42,000 Tons.

There has been a further increase in the capacity of the blast furnaces in operation during the month of November, and we enter December with another record breaker. It must be noted, however, that during November the actual product was not as great as the capacity working foreshadowed. Quite a large number of furnace interests report to us how they were idle days and weeks for lack of coke, and the returns of actual output show some marked falling off from the normal. It is very difficult to estimate the tonnage thus lost, but it certainly was not less than 100,000 tons. This may have helped in reducing stocks, which are now very low, although as an offset the fact must be taken into consideration that with some furnaces the stock on hand was increased from current make simply because it was impossible to get cars enough to ship to consumers who were clamoring for the material.

The weekly capacity of the furnaces in blast on December 1 compares as follows with that of the preceding periods:

	Furnaces in blast.	Capacity per week. Gross tons.
December 1, 1901.....	266	324,761
November 1.....	259	320,824
October 1.....	246	307,982
September 1.....	255	299,861
August 1.....	257	303,847
July 1.....	249	310,950
June 1.....	252	314,505
May 1.....	256	301,125
April 1.....	250	296,676
March 1.....	248	292,899
February 1.....	245	278,258
January 1.....	233	250,351
December 1, 1900.....	211	228,846
November 1.....	201	215,304
October 1.....	213	223,169
September 1.....	228	231,778
August 1.....	240	244,428
July 1.....	284	283,413
June 1.....	293	296,376
May 1.....	292	293,850
April 1.....	291	289,482
March 1.....	293	292,643
February 1.....	296	298,014
January 1.....	280	294,186
December 1, 1899.....	283	296,959
November 1.....	277	288,522
October 1.....	265	278,650
September 1.....	257	267,335
August 1.....	244	267,672
July 1.....	237	263,363
June 1.....	220	251,062
May 1.....	217	250,095
April 1.....	205	245,746
March 1.....	192	228,195
February 1.....	195	237,639
January 1.....	200	243,516

The condition of the charcoal furnaces at the beginning of the month was as follows:

Charcoal Furnaces December 1, 1901.			
Location of furnaces.	Total number of stacks.	Number in blast.	Capacity per week.
New England.....	7	3	187
New York.....	3	1	649
Pennsylvania.....	13	2	93
Maryland.....	4	0	0
Virginia.....	3	2	114
Ohio.....	8	4	238
Kentucky.....	3	0	0
Tennessee.....	5	2	516
Georgia.....	4	1	404
Alabama.....	4	3	1,007
Michigan, Missouri and Wisconsin.....	10	7	4,195
Texas.....	4	0	0
Totals.....	68	25	7,403

As compared with previous months the record of active charcoal furnaces stands as follows:

	Furnaces in blast.	Capacity per week.
December 1, 1901.....	25	7,403
November 1.....	22	7,049

October 1.....	25	7,444
September 1.....	22	6,805
August 1.....	22	6,578
July 1.....	22	7,157
June 1.....	22	7,514
May 1.....	23	7,210
April 1.....	25	7,910
March 1.....	26	8,074
February 1.....	31	8,335
January 1.....	32	7,097
December 1, 1900.....	32	6,779
November 1.....	30	7,923
October 1.....	31	8,248
September 1.....	31	8,227
August 1.....	31	8,295
July 1.....	32	8,492
June 1.....	27	7,605
May 1.....	25	6,894
April 1.....	29	7,838

The condition of the coke and anthracite furnaces at the beginning of the month was as follows:

Coke and Anthracite Furnaces December 1, 1901.			
Location of furnaces.	Total No. of stacks.	Number in blast.	Capacity per week.
New York.....	14	5	6,939
New Jersey.....	7	4	4,130
Spiegel.....	3	3	540
Pennsylvania:			
Lehigh Valley.....	28	17	9,780
Spiegel.....	1	1	139
Schuylkill Valley.....	15	12	9,747
Upper Susquehanna.....	2	1	1,113
Lower Susquehanna.....	9	5	5,312
Spiegel.....	1	1	278
Lebanon Valley.....	12	10	8,393
Pittsburgh District.....	33	30	75,576
Spiegel.....	1	1	2,590
Shenango Valley.....	16	15	21,670
Western Pennsylvania.....	20	14	16,569
Spiegel.....	1	1	721
Maryland.....	5	4	5,446
Wheeling District.....	9	9	13,667
Ohio:			
Mahoning Valley.....	15	14	25,598
Central and Northern.....	14	12	22,054
Hocking Valley.....	2	1	407
Hanging Rock.....	12	10	6,489
Illinois.....	15	13	29,427
Spiegel.....	2	2	1,866
Minnesota.....	1	0	0
Wisconsin.....	4	2	2,247
Missouri.....	1	0	0
Colorado.....	2	2	5,200
Spiegel.....	1	1	400
The South:			
Virginia.....	20	14	9,166
Kentucky.....	5	4	1,627
Alabama.....	38	21	22,326
Spiegel.....	1	1	113
Tennessee.....	16	10	7,331
Georgia.....	1	0	0
North Carolina.....	1	1	437
Total.....	327	241	317,358

In comparison with previous months the record of the coke and anthracite furnaces stands as follows in gross tons:

	Number in blast.	Capacity per week.
December 1, 1901.....	241	317,358
November 1.....	237	313,775
October 1.....	221	300,538
September 1.....	233	293,256
August 1.....	235	297,269
July 1.....	227	303,793
June 1.....	232	306,991
May 1.....	233	293,915
April 1.....	225	288,766
March 1.....	222	284,825
February 1.....	214	278,258
January 1.....	201	243,254
December 1, 1900.....	179	222,067
November 1.....	171	207,381
October 1.....	182	214,921
September 1.....	197	223,551
August 1.....	209	236,131
July 1.....	252	274,921
June 1.....	266	288,771
May 1.....	267	286,956
April 1.....	262	281,644
March 1.....	264	285,596
February 1.....	264	290,010
January 1.....	250	286,729
December 1, 1899.....	253	289,448

There were started in November Douglas in the Shenango Valley, the second Longdale in Virginia, one Bellaire in the Wheeling district, Lawrence in the Hanging Rock region, Mayville in Wisconsin, Grace in the Mahoning Valley, Vanderbilt in Alabama and Clitico in Ten-

nessee. Production was stopped at the Lebanon Valley Furnace, Central Furnace of the American Steel & Wire Company, one Columbus, one South Chicago, one Union and one Bay View furnace of the Illinois Steel Company, Anna in the Mahoning Valley and Clifton in Alabama.

Furnace Stocks.

The position of furnace stocks, sold and unsold, as reported to us, was as below on December 1, as compared with the five preceding months, the same furnaces being represented as in former months. This does not include the holdings of the steel works producing their own iron:

Stocks.	July 1.	Aug. 1.	Sept. 1.	Oct. 1.	Nov. 1.	Dec. 1.
Anthracite and Coke.....	327,761	328,787	318,069	299,824	223,089	181,021
Charcoal.....	64,837	58,542	62,005	61,769	50,162	42,441
Totals.....	392,598	387,329	380,074	361,593	273,251	223,462

PERSONAL.

John G. A. Leishman, formerly president of the Carnegie Steel Company, but now Minister to Turkey, was a visitor in Pittsburgh last week.

Louis C. Krummel has resigned his position as chief engineer and general shop manager of the machinery department of the American Can Company, and has established himself as consulting mechanical engineer at Austin, Ill. He has been connected with the E. W. Bliss Company of Brooklyn, and the American Can Company in Chicago, as technical member of the firm operating the Rudolph & Krummel Machine Works, Chicago, covering a continuous period of 15 years.

W. X. Bixby has been elected chairman of the board of the American Car & Foundry Company, to take the place of the late William McMillan.

George H. Lowe, superintendent of the Valley Works of the Republic Iron & Steel Company, Youngstown, Ohio, has resigned. His successor has not yet been appointed.

Alex. P. McClure, formerly one of the assistants to the superintendent of the Edgar Thomson Steel Works, has resigned and has connected himself with the Tennessee Coal, Iron & Railroad Company, at Birmingham, Ala.

G. G. Blackwell of Liverpool sails for home on the "Lucania" on the 14th inst.

Adolph Lewisohn has retired from the firm of Lewisohn Brothers of New York.

In railroad circles the report is current that W. B. Leeds, who has been prominently identified with the Moore group of iron consolidations, is to become president of the Rock Island Railroad.

P. T. Large, manager of the Buffalo Steel Company's plant at Tonawanda, Pa., was seriously injured last week by a piece of red hot iron which curled about his legs while he was standing near one of the rolls in the mill.

The following appointments and changes have been made effective by the American Steel & Wire Company, Cleveland district, as of date December 1: M. McMurray was appointed general superintendent of Newburg works and blast furnaces, Cleveland district. Henry Barren is now superintendent, Guy Peters, night superintendent; B. S. Rothwell, master mechanic; all of the Newburg steel works. John McIntosh is master mechanic of the Newburg wire mill, and E. B. Tenny is superintendent blast furnaces.

Richard B. Sherman, who for more than 20 years has been identified with Manning, Maxwell & Moore, 85-89 Liberty street, New York, and who has long been the manager of their supply department, has severed his connection with that house. Mr. Sherman has under advisement several business propositions, both of a domestic and foreign character. Mr. Sherman's experience has been in the way of handling all kinds of miscellaneous supplies, such as mechanical apparatus, tools, machinery and steam specialties.

MANUFACTURING.

Iron and Steel.

The statement that the Sligo Rolling Mills of Phillips, Nimaick & Co. of the South Side, Pittsburgh, had been sold to the Panhandle Railroad Company, is incorrect. Negotiations are pending, but have not yet been consummated.

The Ohio Iron & Steel Company, operating Mary Furnace, at Lowellville, Ohio, are making some extensive improvements. A slag handling plant is being built at the furnace by the Brown Engineering Company of Cleveland, Ohio. In addition, The Carbon Limestone Company, of which Robert Bentley is president, have awarded contracts for a 75-ton Marlon steam shovel, 100 Kilbourne & Jacobs cars, and two more H. K. Porter & Co. locomotives.

The Curtis Sheet Steel & Corrugating Company, Zanesville, Ohio, expect to have two more sheet mills completed and in operation in about 30 days. The company recently completed and put in operation two sheet mills and a bar mill, with one stand of cold rolls, so that the completed plant will contain four sheet mills. The company removed the Curtis Steel Roofing Company's plant from Niles to Zanesville, and expect to work most of the product of the sheet mills through the corrugating department, and sell the surplus, if any, in black sheets.

The Wheatland Rolling Mill, at Sharon, Pa., owned by the Continental Iron Company, has started up after being idle for some time.

The deal for the Cumberland plant, sold recently by the Crucible Steel Company of America to Albert F. Baumgartem of Pittsburgh, who in turn deeds it to the Maryland Sheet Steel Company for \$65,000, was put on record at Cumberland, Md., last week.

The report that the Cohoes Works of the National Tube Company, at Cohoes, N. Y., would be greatly enlarged is untrue. However, it is the intention of the National Tube Company to add a few more cutting and threading machines, in order that this mill may have a larger capacity to furnish cut length pipe on orders than at present.

Furnace D of the Edgar-Thomson plant of the Carnegie Steel Company, at Bessemer, Pa., which has been idle since October 16, undergoing extensive repairs and improvements, will resume blast this week. The capacity of the furnace has been somewhat increased, and it is expected to make from 450 to 500 tons per day. This is one of the original furnaces built about 23 years ago by Carnegie Brothers & Co., Limited.

The blast furnace of the Sharon Steel Company, at Sharon, Pa., which has been idle for some time, undergoing repairs, has again been put in blast. This furnace has a daily capacity of about 500 tons of metal, which is cast in chills and used in the basic open hearth plant of the Sharon Steel Company.

Since the destruction of their plant by fire recently, the Crawfordsville Wire & Nail Company, Crawfordsville, Ind., have received many propositions to transfer their manufacturing operations to other localities, but it is believed that they will decide to rebuild in Crawfordsville. The enterprise was so completely a manifestation of local spirit that the directors and stockholders would hardly be willing to see it removed to another locality.

The plant of the Finished Steel Company, at Youngstown, Ohio, was slightly damaged last week by the governor belt on a 30 horse-power engine breaking, causing the engine to run away and scattering debris in every direction. The Finished Steel Company are manufacturers of polished shafting and special shapes, piston rods, pump rods, bridge pins and screw rods. The concern make polished shafting up to 5 inches in diameter and have a very complete plant.

The Carnahan Tin Plate & Sheet Company, Canton, Ohio, manufacturers of tin and terne plates and sheet steel, have made plans for the building of an open hearth steel plant and will probably commence work on it in the near future.

The Whitaker Iron Company, Wheeling, W. Va., manufacturers of black and galvanized sheet iron, tin and terne plate, are now operating four tin mills and also four sheet mills. They are adding three new sheet mills, which they will have in operation in March or April next. The Whitaker Iron Company and the Wheeling Corrugating Company are allied interests and operate between them four sheet mills, four tin mills, eight tinning sets, and a galvanizing department. N. E. Whitaker is president of the Whitaker Iron Company, and A. C. Whitaker is secretary.

Steel & Wike, Philadelphia, Pa., have established a storage plant for structural steel at Twentieth and Clearfield streets, in that city. Walter R. Land is manager of the plant. Facilities for punching, cutting and framing have been installed and all sizes of beams, channels and structural shapes are to be carried in stock.

The Carnahan Tin Plate & Sheet Company of Canton, Ohio, placed two mills of their new plant in operation last Monday. The housings and spindles for three hot mills are in position, and the rolls have been placed in one of them. The new offices of the mill have been completed.

Three of the ten mills in the Chester Works of the American Tin Plate Company, at Chester, W. Va., have been started up. The other seven mills will be put in operation shortly after the first of the year. This was formerly a sheet plant owned by the Chester Rolling Mill Company, but was taken over by the American Sheet Steel Company. The sheet rolls were afterward removed and tin rolls substituted, the plant now being owned by the American Tin Plate Company.

The Parkersburg Iron & Steel Company of Pittsburgh, with works at Parkersburg, W. Va., are building a forge mill in addition to their six mill sheet plant, the approximate cost being about \$100,000. The sheet mills of this concern are nearly ready for operation and will be started this month. The forge mill will consist of puddling furnaces, knobbling fires, bar mill and skelp mill, with necessary equipments.

General Machinery.

The Wellsville Whip Company, Wellsville, Pa., advise us that they will shortly be in the market for considerable new machinery for their factory, which they are to rebuild. It was recently destroyed by fire. J. Milligan is secretary.

The Pennsylvania Engineering Works, New Castle, Pa., builders of blast furnace and steel plant construction, general machinery and plate work and iron and steel cars, have not, as reported, bought 49 acres of land at New Castle, on which to erect a machine shop and structural plant, to cost \$500,000. However, this concern have commenced the erection of an extension to their large machine shops and will install a number of modern iron working tools. The concern are crowded with orders and find it necessary to enlarge their capacity to get out their contracts. The report that work on the machine shop had been delayed on account of inability to secure structural iron, is also untrue. The steel for this building will be delivered as soon as the contractors are ready for it.

A quantity of new equipment is required by Max Levy, 1215 Race street, Philadelphia, Pa., for the glass factory, including power house, boiler and engine and cold storage rooms, which he is to build at Wayne Junction. The structure will be thoroughly fire proof, having a steel trussed roof, and work of erection will be started next week. The plans were prepared by Carl P. Berger of Philadelphia, who will supervise the construction of the plant.

The Walker Engineering Company, who are erecting a plant in Youngstown, Ohio, for the manufacture of steel castings, have increased their capital stock to \$100,000. They are installing one 10-ton and one 20-ton electric traveling crane.

Heyl & Patterson of Pittsburgh, builders of billet and slab conveyors, bar iron conveyors, mechanical boshes, labor saving devices and conveying machinery of all kinds, are erecting a large plant in lower Allegheny, which is pretty well under way. The present works of the concern on Water street, Pittsburgh, are not large enough to handle their rapidly increasing business.

The Red Jacket Mfg. Company, Davenport, Iowa, announce that they have sold to the Loudon Machinery Company, Fairfield, Iowa, their hay tool department, and have transferred the stock and good will pertaining to this branch of the business. The Red Jacket Mfg. Company will devote their entire attention to iron pumps, cylinders and wrought iron pipes.

The Mesta Machine Company, Lewis Block, Pittsburgh, have received an order from the Labelle Iron Works, Steubenville, Ohio, for a Mesta patent pickling machine, to pickle pipe up to 22 feet in length and a large billet shear to cut up to 4 x 30 inch sections on hot steel. The shear will weigh about 125 tons and will be driven by an engine.

The Hickson Furniture & Carpet Company, Muncie, Ind., are in the market for entire equipment for the new brass and iron bedstead plant they are establishing in that city. The buildings they have secured are well adapted for the purpose and they will be equipped with the best modern appliances.

The S. Morgan Smith Company, York, Pa., manufacturers of water wheels, power transmission machinery, &c., intend to make improvements and extensions to their plant, the plans for which have not as yet been completed.

William Wharton, Jr., & Co., Incorporated, Philadelphia, Pa., have taken out city permits and will make additions to their present tool room. The addition will be 16 x 20 feet, and of steel construction.

A. L. Smart of Cleveland, representing the American Foundry & Machine Company, has made a proposition to the town of Ravenna, Ohio, to locate their plant in that place. The company agree to purchase 40 acres of land and ask that 150 town lots be taken by citizens at \$150 per lot, the balance of the land to be used for the plant. They agree to build foundry and machine shops to cost \$150,000, and to employ 125 men at the start, and 400 men when occasion demands.

The Kern Power Company, 254 South Los Angeles street, Los Angeles, Cal., are having plans prepared, and in about 30 days will ask for bids for the power station and machinery. The company are incorporated with a capital of \$5,000,000, fully subscribed, and own water rights on Kern River, where they propose to develop and install a plant capable of developing 10,000 horse-power to Los Angeles, a distance of about 110 miles, principally for the use of the Los Angeles Railway Com-

pany, and for their lines in that city and suburbs. The voltage to be used will be 40,000. The directors are H. E. Huntington, I. W. Hellman, A. Borel, C. De Guigne, W. C. Kerckhoff, A. C. Balch, and H. W. O'Melveny.

Boilers, Engines and Accessories.

The plant of the Clark Engine & Boiler Company, Kalamazoo, Mich., is to be greatly enlarged. These improvements will consist of an addition, 52 x 100 feet, to the foundry and a new boiler room, 50 x 100 feet. The company advise us that their business has increased fully 50 per cent. during the past year, and the indications are that it will be doubled before another year.

The James Leffel Company of Springfield, Ohio, recently secured an order for an 8 x 10 engine for Porto Rico; an engine of the same dimensions, together with boiler, to be installed in a hat factory, Oaxaca, Mexico; a 6½ x 10 automatic engine for an electric light plant on a plantation near Santiago de Cuba; a 6½ x 10 engine and boiler complete, for Barranquilla, United States of Colombia; a 7 x 10 engine and boiler for Monterey, Mexico, and a 7½ x 10 automatic engine, also a small vertical engine and boiler, for Spain.

The Hardy Motor Works is the name of a newly organized company at Port Huron, Mich., to manufacture gasoline engines. The company have incorporated with a capital stock of \$30,000. The stockholders are R. E. Hardy, W. L. Jenks, F. A. Peavey, T. A. Goulden, G. F. Conner and F. J. Watt, the latter being mechanical superintendent. R. E. Hardy was president and manager of the Detroit Motor Works and prior to the organization of that company was secretary and treasurer of the Olds Gasoline Engine Works of Lansing, Mich. He will be general manager of the new company. The company acquire all rights, patents, pattern drawings, &c., in the Har De motor, a gasoline engine recently placed on the market by the Detroit Motor Works. Part of the machinery and space of the Port Huron Mfg. Company's plant has been leased for 60 days, at the end of which time the company will move into a new factory, 60 x 150 feet, now in course of erection.

The Prouty Motor Company, formerly of Chicago, have located in a well equipped plant at Lansing, Mich. They manufacture mine and tramway gasoline locomotives and engines.

The Bradley Mfg. Company, recently organized in Pittsburgh by C. H. Bradley, Jr., of that city and Daniel J. Geary of Oil City, Pa., have decided to erect a plant in Allegheny for the manufacture of engines and pumps. The engines will be of the Williams central valve type. The buildings will be of brick and steel, and a large amount of modern iron working machinery will be installed.

We are officially advised by the Fischer Foundry & Machine Company, South Side, Pittsburgh, that the report that they had sold their property to the Pittsburgh, Virginia & Charleston Railroad is entirely incorrect. This concern have expended in the last three months more than \$75,000 in improving their plant, and have under way at the present time additions which will cost as much more. They are crowded with work for several months ahead and have recently entered some very large contracts for engines and other equipment. They have no intention of selling their plant.

Pumps of 400,000 gallons capacity per minute, engines, boilers, &c., are required by the Sabine Canal Company, who are about ready to begin the construction of a canal near Vinton, La., 150 feet wide and 20 miles long, with 60 miles of laterals. The plant will water 40,000 acres of land. The contracts for grading, clearing, grubbing, fumes, &c., have been let to S. A. Robinson of Vinton. All communications respecting equipment should be addressed to D. M. Duller, assistant engineer, Vinton, La.

John Brennan & Co., Detroit, Mich., boiler makers, have increased their capital from \$35,000 to \$200,000.

Young Brothers, Detroit, Mich., will erect a two-story factory building, 95 x 100 feet, to cost about \$8000. A gas engine will be installed to furnish power. The firm manufacture sheet steel smoke stacks, breechings, tanks, &c., and make a specialty of Cyclone exhaust head and Young's improved automatic water still.

Fires.

The plaster mills of Jerome B. King & Co., at New Brighton, Staten Island, N. Y., were last week destroyed by fire. The loss is estimated at \$150,000, fully covered by insurance.

The Manhattan Brass Company, 362-368 Avenue A, New York City, suffered a \$10,000 loss by fire December 5.

The glove factory of H. Lowenstein, at Johnstown, N. Y., was destroyed by fire December 6. The loss of \$12,000 is covered by insurance.

Exclusive of the grain elevator and the engine house, the plant of the National Starch Mfg. Company, at Des Moines, Iowa, was destroyed by fire December 5, entailing a loss of about \$200,000.

The main building of the Michigan Alkali Company's soda ash plant at Wyandotte, 12 miles from Detroit, Mich., was destroyed by fire December 5. Loss is about \$500,000, with insurance of about \$250,000. The burned building was 250 x 800 feet. It is understood that it will be rebuilt.

The northwest breaker of the Temple Iron Company, situated at Vandling, Pa., was destroyed by fire December 9. The loss is \$45,000.

The Wabash Screen Door Company's plant, Rhinelander, Wis., was entirely destroyed by fire December 9. The total loss is about \$150,000, covered by insurance.

Some little equipment is required by J. M. Martigal & Co., Alma, Mich., who are to rebuild their machine shop and foundry, which were recently destroyed by fire. The loss was \$10,000, with \$3500 insurance.

The hoisting tippie at the mine of the Madison Coal Company of St. Louis, Mo., at Glen Carbon, Ill., was destroyed by fire December 9. The loss is \$6000.

Foundries.

The Westinghouse Foundry Company, recently organized at Pittsburgh, have applied for a charter. The incorporators are George Westinghouse, Herman Westinghouse, George C. Smith, William Scott and W. D. Updegraff. This new company will build a very large foundry at Stewart Station, on the Pennsylvania Railroad, about 25 miles from Pittsburgh.

Herman Broesel, president of the Jefferson Bank, 105 Canal street, New York City, has purchased the New Brunswick Foundry property, New Brunswick, N. J., for \$16,500. It is understood that the plant is to be put in operation shortly.

The Stoddard Mfg. Company, Dayton, Ohio, are building an addition to their foundry. Equipment has all been purchased.

The Dunbar Furnace Company of Philadelphia are building a new foundry at their plant in Dunbar, Pa. They are not in the market for any equipment.

W. W. Lindsay & Co., Philadelphia, Pa., will construct a one-story corrugated iron flask house, 33 x 56 feet, for the Southwark Foundry & Machine Company, at the southwest corner of Fourth and Washington avenue, in the same city.

Bridges and Buildings.

The Pittsburgh Construction Company of Pittsburgh, builders of iron and steel structures, have taken a contract for the erection of the buildings for the Fort Pitt Malleable & Gray Iron Castings Company, at McKee's Rocks, Pittsburgh.

Hardware.

More business has been received by the Van Dorn Iron Works, Cleveland, Ohio, during this year than ever before, and the company now have almost as much as they can handle. The future outlook is referred to as bright.

The increase in business of the Kirk-Latty Mfg. Company, Cleveland, during the last year has been very heavy, and especially so in the export field. Orders have been received from abroad at prices which are very encouraging, and the company feel proud of the fact that a recent order for about \$1000 worth of bolts was shipped to London. The company are now making automobiles in an experimental way.

For the past five months the Metal Goods Mfg. Company, Cleveland, have been running at the rate of 22½ hours a day, in order to keep up with their orders. This will continue until the first of the year, after which the company will return to their old schedule for about 60 days. Shipments of from seven to ten cars of toy wagons and velocipedes are being made each week, and an excellent export trade in Germany, France and Australia is being worked up.

Cleveland Toy & Mfg. Company, Cleveland, Ohio, are doing an excellent business. This concern were incorporated about four months since.

The Southern Foundry & Machine Works, Fredericksburg, Va., are running to their full capacity, having orders in hand that will occupy them until about the beginning of February. Their plant has lately been overhauled and its efficiency increased.

Cleveland Hardware Company, Cleveland, report a very heavy business, far exceeding any former year.

Representatives of seven manufacturing concerns in Chicopee Falls, Mass., held a conference in the office of the J. Stevens Arms & Tool Company on the 3d inst., and the grievances of the various companies against the Boston & Maine Railroad were given thorough airing. Almost without exception the firms represented have had endless trouble in sending out freight from Chicopee Falls since the acquisition of the Connecticut River Railroad by the Boston & Maine system, and the difficulty has now assumed such an aggravated form that it has become unbearable. The conference was held at the invitation of President I. H. Page of the Stevens Company, this concern having been the most hampered in their Western shipments. The other firms represented were Belcher & Taylor, Spalding Mfg. Company, Fiske Mfg. Company, Lamb Knitting Machine Company, Chicopee Mfg. Company, Knit Goods Specialty Company, and the Page Needle Company. With the exception of the Taylor-Bramley Company, who were unable to send a representative, but are in sympathy with the cause, the conference represented all the industries of the Falls who have any business with the railroad company. The matter was given free discussion and the causes for the exasperating delays in the transportation of freight consigned to Western and other points were pointed out to the railroad officials, who were present. As a result of the

conference it is expected that the railroad company will take steps which will remedy the matter.

The Ohio Brass & Iron Mfg. Company, Cleveland, manufacturers of plumbers' brass goods, report that the volume of their business has increased fully 20 per cent. this year.

The Sherwin-Williams Company, Cleveland, report business increasing rapidly, both in their export and domestic trade. The company have lately added a five-story storage building to their already large equipment.

Miscellaneous.

It is probable that the recently organized Florida East Coast Commercial Company, Continental Trust Building, Baltimore, Md., will be in the market for considerable new machinery during the coming year. They have purchased 5000 acres of heavily timbered land at Oak Hill, Fla., where they will erect a saw mill to clear the land. In order to clear 1000 acres as rapidly as possible the company's output the first year will be confined to sawn timber. A modern sugar refinery with a capacity of 25 tons of granulated sugar per day will also be erected at Oak Hill, which will require the planting of 4000 acres of cane to keep it in operation all the year. The company will expend \$400,000 in establishing their refinery and plantation. George F. Jones is president and William W. Dix is treasurer. Among the other prominent capitalists of Baltimore who are heavily interested are O. B. Zanziger, R. N. Ryon, Hon. Conway W. Sams, Frank H. Callaway and A. Frank Gilbert. Cornelius Christlaney, Oak Hill, Volusia County, Fla., is general superintendent.

The entire stockholding, real estate, plant, equipment and patterns of the Lackawanna Lubricator & Mfg. Company of Scranton, Pa., have been acquired by certain stockholders of the Crescent Mfg. Company of Connellsville, Pa. By the purchase of the entire stock of the Lackawanna Lubricator & Mfg. Company the latter retain their corporate name and individuality. The devices of the company, however, will be manufactured by the present manufacturing company under contract, and the equipment of the Lackawanna Lubricator & Mfg. Company has been removed to Connellsville, Pa.

The Solvay Process Company, Syracuse, N. Y., have purchased the property of the American Steel Casting Company, adjoining their plant. The Solvay Company have no particular plans as to what use they will make of the property, but it is probable that it will be used for further extensions as necessity demands.

The Austin-Bryan Mfg. Company, Birmingham, Ala., have increased their capital stock from \$75,000 to \$150,000. The increase will be used principally in developing their export trade in complete steel plows and agricultural implements. The company have a small rolling mill and produce there the steel beam billet from the 4-inch billet.

The Toledo Wire & Iron Works, of which Frank Powell & Co. are proprietors, are preparing plans for a new factory building. It will be four stories, 50 x 110 feet, of brick and stone. The company manufacture wire and iron fences, office railings, steel structural fittings, &c.

The Crystal Ice Company of Youngstown, Ohio, will install a new refrigerating plant giving capacity of 60 tons per day.

The Washington Coal & Coke Company, N. P. Hyndman, general sales agent, Conestoga Building, Pittsburgh, have received a contract from the Pittsburgh Gas & Coke Company, operating by-product coke ovens at Glassport, Pa., for their entire supply of coal for 1902, to be used in making by-product coke. They have had this contract for a number of years and their coal has given such good satisfaction that the contract has again been renewed for next year. They recently placed an order for 100 30-ton coke cars with the Barney & Smith Car Mfg. Company, Dayton, Ohio.

The Chambersburg Woolen Company, Chambersburg, Pa., are to be reorganized, with a capital of \$200,000. Large additions of improved machinery are being placed in the mill, and more will follow until it is made a complete plant. A new wool house and picker house will be built. A new 150 horse-power engine will supplement the power now used. H. M. White and E. N. Hutton will take an interest in the mill, with the former as president and the latter as treasurer. D. K. Appenzeller will be manager and Mr. Murr, late of the Wilson Woolen Company, near Trenton, N. J., will continue as superintendent. It is probable that the company will be in the market for equipment from time to time.

Isaac H. Davis and Edwin D. Mellen, doing business under the name of the Crest Mfg. Company, at Cambridgeport, Mass., have incorporated under the same name. They manufacture gasoline motors, automobiles and accessories.

Wickham, Chapman & Co., Springfield, Ohio, manufacturers of piano plates, are building an addition, 48 x 328 feet, to their plant, to be used as a finishing and shipping room. No equipment is required.

The Alabastine Company, Grand Rapids, Mich., are building a brick and iron plaster mill and separate power house, to replace the mill which was recently destroyed by fire. The mill will have a capacity of 120 tons of stucco per ten-hour day, and

the power plant will be of 250 horse-power capacity, equipped with Allis-Corliss engine. All equipment has been purchased.

S. Longbottom & Sons, proprietors of the Crum Lynne Worsted Mills, Crum Lynne, Pa., are building a 40 x 80 foot addition to their plant. They intend to tear down the frame wool store house and replace it with a brick structure to be used for manufacturing.

The Vulcan Sheet Metal Company, Denver, Col., recently organized, have leased a plant and will make sheet steel pipe and other sheet metal work. The company are closely allied to the Vulcan Iron Works Company of that city.

The Sharon Coke Company, an interest of the Sharon Steel Company of Sharon, Pa., are placing orders with Pittsburgh concerns for mine coal holsting machinery. The Sharon Coke Company own a large block of coal in the Masontown coking field, on which they will sink a shaft 200 feet. They are erecting a plant for by-product coke ovens at Sharon, and will ship the coal from this mine to Sharon, for making coke.

The Mellott Heating Company of Pittsburgh have been organized with a capital of 50,000. The officials are Eli Thomas, president and general manager; A. S. Thomas, vice-president, and T. B. Shirley, secretary and treasurer. The company will manufacture patent heating apparatus under patents which they own and control.

The Union Steel Company, Empire Building, Pittsburgh, have taken a lease of the old Volunteer Hematite mine, at Palmer, Marquette range, where there are large quantities of low grade ores. The mine was taken over December 1, and will be unwatered at once in preparation for active exploration and for something in the way of shipment another season. The mine was idle ten years previous to 1900, when it was worked for a few months by the Cleveland Cliffs Iron Company.

The McConway & Torley Company of Pittsburgh, manufacturers of the Janney coupler, are making some changes and repairs to their plant, which will slightly increase the capacity.

The business of Glorieux & Woolsey, Irvington, N. J., smelters of gold and silver ores, has been incorporated under the name of the Glorieux-Woolsey Company.

The Hampton Roads Creosoting Company, recently incorporated with a capital stock of \$150,000, intend to build and operate a plant for the treatment of wood for preservation. All communications should be addressed to the president, E. A. Buell, Norfolk, Va.

The Big Stone Gap Iron Company, Big Stone Gap, Va., contemplate building 100 coke ovens.

The Rhoades-Carmean Buggy Company, Marshalltown, Ia., have let the contract for a brick addition, 110 x 180 feet to their plant. It will be four stories high and will be completed by April.

The Oskaloosa Mfg. Company of Oskaloosa, Ia., have purchased a site on which to build a factory, 90 x 90 feet, three stories high, for the manufacture of Hawkeye wagons. They also expect to engage in the light vehicle trade to the extent of finishing and trimming jobs purchased in the white.

The A. A. Cooper Wagon & Buggy Company of Dubuque, Iowa, have had plans prepared for their new factory which they purpose to erect in the spring. The designs show a building 1000 feet long by 200 feet wide, having railroad tracks running through the center and along each side. All the iron will be brought in on the center track, the cars of wagon stock will be taken in on the south side, while the shipping will be from the north track. The first floor will be devoted to the heavy wood working machinery, wheel and blacksmith departments, and the like, and the second story will consist of two 64-foot wide galleries running the length of the building. A glass roof will afford plenty of light. Stretching across the center of the building above the second story galleries will be a bridge 200 x 72 feet, on which the offices will be located. An elevated tramway will afford an easy method of loading on the Mississippi River steamboats, which lie at the levee across the street, while a quarter mile of track will connect the factory with four railroads. The engines located in the basement will be connected to dynamos, and each machine will be run by its own electric motor. The eight buildings now used as factories, paint shops, &c., will be used as warehouses, thus giving 25 acres of storage room.

The Hinde & Dauch Paper Company, Sandusky, Ohio, are enlarging their plant. They will not need any new equipment.

The Bessemer Electric Company of Bessemer, Ala., have transferred their property to the Birmingham Railway Light & Power Company of Birmingham, Ala., who propose to extend the plant.

It is probable that the new plant of the Pittsburgh Friction Draft Gear Company will be located at Canton, Ohio.

The Vulcan Western Company, Streator, Ill., are daily shipping large quantities of tin scrap to Ensley, Ala. The company purchase tin scrap which they subject to a special chemical process by which they remove the tin, after which the scrap is baled and shipped to steel works for remelting purposes.

The Hecla Portland Cement & Coal Company, Bay City, Mich., who are erecting a 1000 barrel Portland cement factory

in that city, have let the contract for the erection of a machine shop, 60 x 100 feet. Equipment has been purchased.

The Ohio & Colorado Smelting Company, recently incorporated with capital stock of \$3,000,000, are building a reduction plant at Saleda, Col., with a capacity of 1000 tons per day. They will treat all kinds of ore, matte and bullion. J. C. Kortz and others of Pueblo, Col., are interested.

The Printers' Roller Washing Machine Company, 12 Reade street, New York City, recently incorporated, will shortly place their roller washing machines on the market. They will be manufactured by contract. Weld & Sturtevant are the sole agents.

The Southern Can Company, 2120-2122 Boston street, Baltimore, Md., recently incorporated, have secured a plant formerly used for the manufacture of cans, and are equipping it with new machinery.

The Leo Slinger Chemical Company of Fremont, Ohio, have been incorporated with \$20,000 to manufacture a chemical boiler cleaner. The company have been in business for some time, but have lately interested new capital and have increased the capacity of their plant to 100 barrels per day.

The Water Works Department of Mansfield, Ohio, have been authorized to buy considerable new equipment for the pumping station. They will buy an air compressor to cost \$13,000, two boilers \$5000, purifiers, condensers, check valves, governors, &c.

The Timken Roller Bearing Axle Works of Canton, Ohio, have commenced operations in their newly completed plant.

OBITUARY.

JOHN G. BAKER.

John G. Baker, vice-president of the Enterprise Mfg. Company, Philadelphia, died on the 9th inst. at his residence in that city. Mr. Baker was born near Princeton, N. J., May 11, 1833, and served an apprenticeship as a carpenter. Later he became a model maker for the Government in the Patent Office. One of his early inventions was the glazier's point, a tool in universal use. Later he perfected a machine for toothed saws, which is to-day used in the Disston Works, that concern having acquired the patent. In 1864 Mr. Baker associated himself with T. Henry Asbury, and with him incorporated the Enterprise Mfg. Company. In 1888 Mr. Baker retired from active business life.

NOTES.

GUSTAV A. CLAASEN, proprietor of the Canal Street Foundry, in Lyons, N. Y., died on December 3, from a stroke of paralysis, aged 61 years. He was born in Germany and came to this country when a youth. In 1857, with two associates, he established the Canal Street Foundry, an enterprise which he conducted up to the time of his death, latterly under the firm name of G. A. Claasen & Sons.

CHARLES S. PADGETT, manager of the Cumberland Nail & Iron Works, Bridgeton, N. J., died there on December 4, after a short illness from typhoid fever. Mr. Padgett took part in the Civil War with the Twelfth Regiment, New Jersey Volunteers, and lost a leg at Chancellorsville.

JAMES W. PORTER of Sewickley, Pa., and president of the Carroll-Porter Boiler & Tank Company, in Pittsburgh, with works at Wellsville, Ohio, died suddenly in New York City last week.

A new record for the erection of the structural steel skeleton of a modern skyscraper has been established by the Thompson-Starrett Company, builders, of New York, at the building corner of Cedar and William streets, almost in the heart of New York's financial center. The structure, 15 stories in height, covers a plot 60 x 130 feet, and on November 9 the task of demolishing the old building which occupied the site was completed. Upon December 4, or in exactly 25 days, including Sundays, the enormous task of erection was completed, and it is stated by the contractors that the building will be ready for occupancy by February 15. The steel was furnished by the American Bridge Company and fabricated in their Trenton branch. Shop details for the work were furnished over a period of four weeks, commencing September 8, and the building was shipped complete in a trifle over nine weeks after receipt of the details.

The Iron and Metal Trades.

A decision of far reaching importance has been arrived at by the managers of the United States Steel Corporation. After considerable discussion and a number of conferences it has been determined to fix the price of Lake Iron Ore for the coming season the same as it was during the current season—viz., \$4.25, as the base price for Old Range Ores, at lower lake ports. Some of the outside Ore interests showed a strong disposition to favor an advance, while in isolated cases a moderate lowering was advocated. While an official announcement on the part of the Ore producers has not yet been made, it may be accepted as practically settled that present Ore prices will prevail for another season.

The feeling among those who shape the policy of the predominating interest is that stability in prices for such a fundamental raw material like Ore should be striven for. It is believed that such a course will avoid the unsettling of confidence in the future among consumers of Steel, with its attendant adverse influence upon consumption.

The same tendency has been displayed in certain finished lines. The Beam and Plate associations have held their meetings during the past week, and after continuing the life of these organizations for another year have left the prices to remain where they were, although some of the Beam makers were inclined to demand higher figures.

Our monthly blast furnace statistics furnish further proof of the tremendous consumption which is now going on. On December 1 there were Coke and Anthracite stacks in operation with a capacity of 317,358 gross tons, an increase of 3583 tons as compared with November 1. In the past month stocks have declined 42,000 tons. Counting in the Charcoal furnaces, we are now producing at the rate of 16,850,000 tons per annum, as against the maximum record of 13,789,000 tons in 1900, and yet we are constantly drawing on what little stock the country is carrying.

It should be noted, however, that the difficulties in securing a supply of Coke made the production of November fall below the quantity indicated by the blast furnace returns of the beginning of that month. A study of the figures of November output justifies the belief that this cause caused a deficiency of product of close to 100,000 tons. On the other hand, some furnaces had to pile Iron because they could not get cars to send it to customers eager to secure the raw material.

Probably such a condition of affairs would in the olden times have led to a higher range of values on Ore, particularly since some lines of rolling mill products, like Rails, are very heavily sold ahead.

Quite a number of independent furnacemen have contracted for their next year's supply of Coke at \$2.15 to \$2.25 at oven, an advance over last year.

In the Chicago district an interesting development has been that a number of Malleable Iron foundries unable to secure prompt delivery of Coke Pig Iron have turned to Charcoal Pig. Some good sales have been made and others are pending.

Some large tonnage has been placed in Plates, both in the Philadelphia and in the Chicago districts.

A Comparison of Prices.

At date, one week, one month and one year previous.

Advances Over the Previous Month in Heavy Type. Declines in Italics.

	Dec. 11, 1901.	Dec. 4, 1901.	Nov. 13, 1901	Dec 12, 1900
PIG IRON:				
Foundry Pig, No. 2, Standard, Philadelphia.....	\$15.50	\$15.50	\$15.25	\$15.75
Foundry Pig, No. 2, Southern, Cincinnati.....	14.25	14.25	13.75	13.75
Foundry Pig, No. 2, Local, Chicago.....	15.50	15.50	14.75	14.50
Bessemer Pig, Pittsburgh.....	16.25	16.00	16.00	13.50
Gray Forge, Pittsburgh.....	15.00	14.75	14.50	13.25
Lake Superior Charcoal, Chicago..	18.00	17.50	17.00	19.50
BILLETS, RAILS, ETC.:				
Steel Billets, Pittsburgh (nom)....	28.00	28.00	27.00	19.75
Steel Billets, Philadelphia (nom)...	29.00	28.00	29.00	21.00
Steel Billets, Chicago, (nom).....	.....	.....	.....	20.75
Wire Rods (delivered).....	34.50	32.00	35.00	33.00
Steel Rails, Heavy, Eastern Mill..	28.00	28.00	28.00	26.00
Spikes, Tidewater.....	2.00	2.00	1.80	1.50
Splice Bars, Tidewater.....	1.65	1.65	1.50	1.25
OLD MATERIAL, PER GROSS TON:				
O. Steel Rails, Chicago.....	14.00	14.00	14.00	11.00
O. Steel Rails, Philadelphia.....	17.75	17.50	17.00	16.00
O. Iron Rails, Chicago.....	21.00	21.00	21.00	17.00
O. Iron Rails, Philadelphia..	21.50	21.50	21.00	17.50
O. Car Wheels, Chicago.....	15.50	15.50	16.00	15.50
O. Car Wheels, Philadelphia (nom)..	16.75	16.25	16.50	17.00
Heavy Steel Scrap, Chicago.	13.50	13.50	13.50	11.00
FINISHED IRON AND STEEL, PER POUND:				
Refined Iron Bars, Philadelphia...	1.65	1.65	1.65	1.45
Common Iron Bars, Chicago.....	1.65	1.65	1.65	1.45
Common Iron Bars, Youngstown..	1.55	1.65	1.55	1.30
Steel Bars, Tidewater.....	1.70	1.70	1.62½	1.40
Steel Bars, Pittsburgh.....	1.50	1.50	1.50	1.25
Tank Plates, Tidewater.....	1.75	1.75	1.75	1.58
Tank Plates, Pittsburgh.....	1.60	1.60	1.60	1.40
Beams, Tidewater.....	1.75	1.75	1.75	1.65
Beams, Pittsburgh.....	1.60	1.60	1.60	1.50
Angles, Tidewater.....	1.75	1.75	1.75	1.55
Angles, Pittsburgh.....	1.60	1.60	1.60	1.40
Skelp, Grooved Iron, Pittsburgh..	1.75½	1.80	1.80	1.45
Skelp, Sheared Iron, Pittsburgh..	1.80	1.85	1.85	1.50
Sheets, No. 27, Pittsburgh.....	2.90	2.90	3.00	2.90
Barb Wire, f.o.b. Pittsburgh.....	2.90	2.90	2.90	2.80
Wire Nails, f.o.b. Pittsburgh.....	2.60	2.05	2.15	2.20
Cut Nails, Pittsburgh.....	2.05	2.05	2.05	1.95
METALS:				
Copper, New York (nom).....	16.50	16.50	16.85	16.75
Spelter, St. Louis.....	4.17½	4.20	4.12½	4.05
Lead, New York.....	4.37½	4.37½	4.37½	4.37½
Lead, St. Louis.....	4.25	4.25	4.25	4.20
Tin, New York.....	25.25	24.50	25.80	26.25
Antimony, Hallett, New York....	8.37½	8.37½	8.37½	9.25
Nickel, New York.....	60.00	60.00	60.00	55.00
Tin Plate, Domestic Bessemer, 100 lbs., New York.....	4.19	4.19	4.19	4.19

Chicago.

FISHER BUILDING, December 11, 1901.—(By Telegraph.)

The Coke situation continues to be an important feature of the local Iron trade. Six furnaces more would be in blast in this district if sufficient fuel could be secured to enable them to run, and of these four would be manufacturing Iron for the merchant trade. It is difficult to secure enough Coke to keep the remaining furnaces in operation and to supply the foundries. Coke is being drawn from every possible source of supply, and the variation in its quality causes great annoyance to both producers and consumers. The scarcity of cars is also interfering with Steel shipments from Pittsburgh and other Eastern points. Southern furnace companies are having trouble on the same account. The consumption of Iron and Steel keeps up to its recent large proportions, and from present appearances it will be some time until the supply is adequate for all requirements. The scarcity of material is felt more seriously in Steel than in Finished Iron.

Pig Iron.—The general demand is very good and special causes are contributing to an unusually heavy trade in certain classes of Iron, especially Lake Superior Charcoal. The regularity of the product of the local furnaces being impaired by the use of all kinds of Coke and their output being cut down, a sharp demand has been thrown on Charcoal furnaces for quick

shipment by the malleable foundries. Sales have thus been made up to \$19 and even \$19.50. Large inquiries are in the market, one calling for 6000 tons, another for 5000 tons and several for quantities ranging from 1000 to 3000 tons of Foundry Iron. The local furnaces are quoting cautiously on large inquiries and will continue to do so until the question of a sufficient fuel supply is satisfactorily settled. For this reason orders are being taken for deliveries beginning, say, April or May, while orders for earlier delivery are usually passed. The Southern furnace companies being in better position with regard to fuel are benefited by this situation and are making the most of the tonnage now coming up. Commission houses are confident that a great deal of Iron must still be bought to cover the needs of consumers for the first half of next year. An advance of 20c. per ton is announced on the freight rate on Southern Iron by the railroad companies north of the Ohio River, to go into effect January 1. We quote as follows:

Lake Superior Charcoal.....	\$18.00 to \$19.00
Local Coke Foundry, No. 1.....	16.00 to 16.50
Local Coke Foundry, No. 2.....	15.50 to 16.00
Local Coke Foundry, No. 3.....	15.00 to 15.50
Local Scotch, No. 1.....	16.00 to 16.50
Ohio Strong Softeners, No. 1.....	17.00 to 17.85
Southern Silvery, according to Silicon.....	16.15 to 16.40
Southern Coke, No. 1.....	15.65 to 16.15
Southern Coke, No. 2.....	15.15 to 15.65
Southern Coke, No. 3.....	14.65 to 15.15
Southern Coke, No. 1 Soft.....	15.65 to 16.15
Southern Coke, No. 2 Soft.....	15.15 to 15.65
Foundry Forge.....	14.15 to 14.65
Southern Gray Forge.....	14.15 to 14.65
Southern Mottled.....	14.15 to 14.65
Southern Charcoal Softeners, according to Silicon.....	15.00 to 16.00
Tennessee Silicon Pig.....	16.40 to 16.65
Alabama and Georgia Car Wheel.....	19.50 to 20.50
Malleable Bessemer.....	17.00 to 17.50
Standard Bessemer.....	.... to 17.50
Jackson County and Kentucky Silvery, 8 per cent. Silicon.....	17.00 to 17.65

Bars.—Bar Iron manufacturers expect a somewhat less active condition of trade for the remainder of this month, owing to the approaching inventory season. Nevertheless quite a good volume of business is reported. The scarcity of Steel is felt to a considerable extent in Bars and the supply is not equal to the demand. The shortage is particularly noticeable in small Angles, Tees and Channels. The Deering Harvester Company have equipped a mill and are now rolling small Angles and other Shapes from Old Steel Rails for their own purposes. Rumors have been current that the Republic Iron & Steel Company have closed or are about to close a number of their mills, but official denial is made, the company stating that such of their mills as have recently been idle have been made so by merely temporary causes. They have plenty of business booked and expect to keep their mills in continuous operation. Mill shipments are quoted at 1.65c. to 1.80c., Chicago, for both Iron and Steel. The quotations from store are held at 1.90c. to 2c. for either Iron or Steel. The demand from store is not only large, but is heavier than during the latter part of November. Steel Hoops are firm at 2.50c., base.

Structural Material.—Plenty of business is offering in small lots. The Scully Steel & Iron Company have contracted for an additional building to take about 2400 tons. Prospects for the building trade have seldom been brighter than at present. A new building project comes up every day or two. The building enterprises now in sight involve an aggregate of 12,000 tons, which must shortly be placed. The mills report more tonnage on their books than ever before in their history. Mill shipments are quoted as follows: Beams, Channels and Zees, 15 inches and under, 1.75c. to 1.90c.; 18 inches and over, 1.85c. to 2c.; Angles, 1.75c. to 1.90c. rates; Tees, 1.80c. to 1.90c.; Universal Plates, 1.75c. to 1.85c.; small lots of Beams and Channels from local yards are quoted at 2.25c.; Angles, 2c. rates; Tees, 2.15c.

Plates.—The situation is greatly improved. Orders have increased in number and quantity. The Illinois Steel Company have resumed operations with their Plate mill and have orders booked for a month's run and negotiations are proceeding for a considerable tonnage. Jobbers report an increased demand from their trade. Mill shipments are quoted as follows: Tank Plate, ¼-inch and heavier, 1.75c. to 1.80c., Chicago; Flange, 1.85c. to 1.95c.; Marine, 1.95c. to 2.05c. Jobbers

are selling small lots from store at 1.90c. to 2c. for Tank, and 2.25c. for Flange, with the usual extras for heads, segments, lighter gauges, &c.

Sheets.—The supply of Sheets has not yet been restored to its normal condition. The leading Sheet manufacturers have by no means caught up with their back orders, and the independent mills starting up hardly get into the market until they are filled with orders taking their output for 60 days or more. Large consumers are eagerly seeking a better supply and are satisfied to take whatever they can get. The jobbing trade is still suffering from a shortage of Wood's Smooth Sheets and Planished Iron, for which a special demand always exists. Mill shipments of No. 27 Black Sheets are quoted at 3.15c. to 3.40c., Chicago, and small lots from stock are selling at 3.50c. to 3.70c. Galvanized is in somewhat better supply and small lots are selling at 70 to 70 and 2½.

Merchant Pipe.—Trade is considered in normal condition for December. The volume of business is better than usual this month, but has fallen to smaller proportions than during November. The open weather enables building operations to be actively prosecuted, and this fact causes the local consumption to run in excess of December in other years. Carload lots are now quoted as follows, random lengths: Black, ¼ to ½ inch, 60 off; ¾ to 10 inches, 67 off; Galvanized, ¼ to ½ inch, 47 off; ¾ to 6 inches, 55 off.

Boiler Tubes.—While an active demand exists prices are unchanged. Quotations are as follows:

	Steel.	Iron.
2½ to 5 inches.....	57½	47½
1¼ to 2¼ inches.....	50	40
1 to 1½ inches.....	35	30
6 inches and larger.....	52½	45

Merchant Steel.—Manufacturers could take considerable more business if they were in a position to insure deliveries as desired. The mills are crowded with work, and specifications are coming in so heavily against contracts that they are unable to meet the full requirements of their customers. Mill shipments, Chicago, are quoted as follows: Smooth Finished Machinery Steel, 2c. to 2.10c.; Smooth Finished Tire, 1.85c. to 2c.; Open Hearth Spring Steel, 2.30c. to 2.40c.; Toe Calk, 2.40c. to 2.60c.; Sleigh Shoe, 1.85c. to 1.90c.; Cutter Shoe, 2.40c. to 2.60c.; Cold Rolled Shafting, 55 off in carload lots. Ordinary grades of Crucible Tool Steel are quoted at 6¼c. for carloads and 7c. to 7½c. from store; Specials, 12c. upward.

Rails and Track Supplies.—Numerous inquiries are being received, particularly from projected electric roads. These projects contemplate the beginning of Track construction in the spring, but the sold up condition of the local mills prevents the consummation of such contracts. The steam roads are placing some orders with Eastern mills, but it is difficult now to find a mill which will promise delivery earlier than August. Standard Sections are held at \$28 and Light Rails at \$30.50 to \$35. Track Fastenings are as follows: Splice Bars, 1.70c. to 1.80c.; Spikes, 2c. to 2.10c.; Track Bolts, with Hexagon Nuts, 2.90c. to 2.95c.; Square Nuts, 2.75c. to 2.80c.

Billets.—Bessemer Billets appear to be completely out of the market. It is stated that negotiations for foreign Billets are being made by some of the consumers in this section. One order of this character has already been placed and it is likely that others will follow. Open Hearth Billets are selling in carload lots at \$33 to \$35.

Old Material.—Dealers are not willingly accepting the prices which have been named to them by the rolling mills. Some of the dealers state that they will themselves pay a higher price than named by the mills. At the same time some of the mills report that they have been able to secure quite a quantity of Scrap from dealers outside of the city at their prices. A good demand exists for Old Steel Rails and Heavy Melting Scrap, but generally speaking the market is inclined to quietness. The following are approximate quotations per gross ton:

Old Iron Rails.....	\$21.00 to \$21.50
Old Steel Rails, mixed lengths.....	14.00 to 14.50
Old Steel Rails, long lengths.....	10.50 to 20.50

Heavy Relaying Rails.....	25.50 to	26.00
Old Car Wheels.....	15.50 to	16.00
Heavy Melting Steel Scrap.....	13.50 to	14.00
Mixed Steel.....	10.50 to	11.00

The following quotations are per net ton:

Iron Fish Plates.....	\$16.00 to	\$16.50
Iron Car Axles.....	19.00 to	20.00
Steel Car Axles.....	18.00 to	18.50
No. 1 Railroad Wrought.....	15.00 to	15.50
No. 2 Railroad Wrought.....	13.25 to	13.75
Shafting.....	16.00 to	16.50
No. 1 Dealers' Forge.....	13.00 to	13.50
No. 1 Bushing and Wrought Pipe.....	11.50 to	12.00
Iron Axle Turnings.....	11.25 to	11.75
Soft Steel Axle Turnings.....	10.50 to	11.00
Machine Shop Turnings.....	9.50 to	10.00
Cast Borings.....	5.00 to	5.25
Mixed Borings, &c.....	5.25 to	5.50
No. 1 Boilers, cut.....	11.00 to	11.50
No. 2 Boilers, cut.....	10.00 to	10.50
Heavy Cast Scrap.....	11.00 to	11.50
Stove Plate and Light Cast Scrap.....	8.50 to	9.00
Railroad Malleable.....	12.50 to	13.00
Agricultural Malleable.....	11.50 to	12.00

Metals.—Carload lots of Lake are unchanged at 17c. and Casting brands at 16½c. Pig Lead likewise stands at the old figure of 4.32½c. for Desilverized and 4.42½c. for Corroding in 50-ton lots. Dealers quote selling price on small lots of Old Metals as follows: Copper Wire and Heavy, 14½c. to 14¾c.; Copper Bottoms, 13¾c.; Pipe Lead, 4c.; Zinc, 2.75c.

Coke.—Foundrymen are paying premiums for such Coke as they can secure and are taking it without regard to brand or quality, paying \$5.50 per ton or more. Contracts for future delivery are being made at \$5 for 72-hour Foundry Coke.

The American Sheet Steel Company have removed their Chicago offices from the eleventh floor of the Marquette Building to a larger suite of rooms on the tenth floor of the same building. The company's Chicago business is not only large, but is constantly increasing and it was found necessary to secure additional space to accommodate a greater office force.

Philadelphia.

FORREST BUILDING, December 10, 1901.

The market has become more perplexing than ever, and with so many conflicting influences to consider it is utterly impossible to form any very clear cut ideas in regard to its ultimate course. It is satisfactory, however, to know that the immediate conditions are excellent. There is a positively overwhelming volume of business, and, if everything goes through as expected, the capacity for manufacturing will be strained to the utmost. This is the more remarkable when we consider that these conditions have been operative to a large extent for nearly three years, but at no time has there been such a congestion of business as there is at the present time. This statement may be made without the least reservation; but, to go beyond that, would be to tread on dangerous ground. Some people think higher prices are almost inevitable, but the majority are of opinion that they are high enough and to take advantage of what may, after all, be only a temporary scarcity would not be good business policy. There is a surprising mixing up of things, however, and it is almost impossible to construct any good working theory out of the diverse elements which are now in evidence. The railways are hampered for want of rolling stock, the furnaces for want of Coke, the mills for want of Pig Iron, Billets and Coal, the bridge works, shipyards and architectural interests for want of Shaped Material, the Stove and Sheet Metal trades for want of Tin Plates, Light Sheets, &c. The question to be considered in this connection is, How soon, or how long will it be before transportation facilities will reach normal conditions, and what effect will this have when freight begins to move freely? A slackening up in consumption is always expected at this season, and if the railways are in a condition to move freights freely, a slight relaxation in prices should not be at all unexpected. On the other hand, however, if there is to be a severe winter and the roads get blocked, the shortage of material would be even more serious than it has yet been. Considerations of this character make it impossible for any one to say with any reasonable certainty what the course of the market will be, but most people are so well

satisfied with the present that they are not worrying much about the future.

Pig Iron.—The heavy purchases made during the past two or three weeks gives to-day's market a very tame appearance, compared with its recent condition. Prices are firmer, however, and sales during the past few days average a full 25c. per ton advance on the prices ruling the week previous. Many large buyers covered a portion of their probable requirements for the first and second quarters of 1902, several days ago, so that most of last week's sales were for immediate shipment, and on such business as we have said, prices are 25c. per ton dearer. It is quite likely that the slackening up in the demand will continue until after the turn of the year. Ordinarily it might be said that such would undoubtedly be the case, but the times and conditions are so exceptional that a suggestion on that point is about as far as any conservative opinion would permit. It is true that nearly all the business entered for next year's deliveries is at less money than is being quoted to-day, but it is equally true that makers of Pig Iron have advanced their prices, and buyers have no alternative but to pay the price or leave the Iron. Circumstances may occur which will lead to a modification of these views in a little while, but there are no signs of it yet. Prices are rather hard to quote with exactness, however. When deliveries are easy both as to time and distance the buyer can do better than the one who has to pay for a long haul, but the range for Philadelphia and nearby points would be about as follows: No. 1 X Foundry, \$16.25 to \$16.50; No. 2 X Foundry, \$15.75 to \$16.25; No. 2 Plain, \$15.35 to \$15.65; Standard Gray Forge, \$14.50 to \$14.75; Ordinary Gray Forge, \$13.75 to \$14; Basic (Chilled), about \$14.50 to \$14.75, and Bessemer at \$15.75 to \$16.

Billets.—Scarce, and little if anything is being done. Prices hardly quotable, although about \$30 would be the price for prompt shipments.

Muck Bars.—There is not much demand, but prices are steady at \$27.50 to \$27.75, f.o.b. cars, sellers' mills.

Plates.—There has been a good demand during the past week, and mills have taken in a great deal of business, including several lots of 4000, 3000 and 2000 tons each, besides a number of smaller lots. The Lukens Iron & Steel Company have taken a very heavy tonnage, but with the new mill approaching completion they will be in a position to take care of their trade with their usual promptness. The proposed combination of the Eastern mills has fallen through, but an agreement has been made by which prices will be maintained at the same figures as during the past several months—viz., for Philadelphia and nearby deliveries: Universals, 1.75c. to 1.80c.; Sheared, 1.75c. to 1.80c.; Flange, 1.85c. to 1.95c.; Fire Box, 1.95c. to 2.05c.; Marine, 1.95c. to 2.05c.; C. H. No. 1 Iron, 2.40c.; C. H. No. 2 Flange, 2.90c.; C. H. No. 1 Flange Fire Box, 3.40c.

Structural Material.—The difficulty in securing deliveries is not abated in the slightest degree, and those whose necessities are imperative have no alternative but to pay special prices. Nominal quotations being as follows for seaboard or nearby deliveries: Angles, 1.75c. to 1.85c.; Beams and Channels, 15-inch and upward, 1.75c. to 1.85c.

Bars.—The higher cost of material is likely to lead to higher prices for Bars. A meeting of the Eastern Bar Iron Association is expected to be held on Friday, when some action will be taken in regard to the matter. Meanwhile quotations are firm at 1.67c. to 1.72c., delivered for Iron Bars, Steel at 1.70c. to 1.75c.

Sheets.—The demand is very active, and, as in most other departments, deliveries are very much behind. Prices for deliveries during January and February in carload lots would be quoted about as follows: No. 10, 2.30c. to 2.40c.; No. 14, 2.50c.; Nos. 16 and 17, 2.90c.; Nos. 18-21, 3c.; Nos. 26, 27, 3.20c. to 3.30c.; No. 28, 3.40c.

Old Material.—There is a good demand, and with light supplies prices are firm with sales, and bids and offers about as follows for deliveries in buyers' yards: Low Phosphorus Scrap, \$21.50 to \$22; Choice Railroad Scrap, \$20 to \$21; Country Scrap, \$16 to \$17; No. 2 Light (Ordinary), \$12.50 to \$12.75; No. 2 Light (Forge), \$14 to \$14.75;

Machinery Cast, \$14 to \$14.50; Heavy Steel, \$17.75 to \$18.25; Old Steel Rails, short lengths, \$17.75 to \$18.25; Old Iron Rails, \$21.50 to \$22; Wrought Turnings, \$12.75 to \$13.25; Cast Borings, \$8 to \$8.50; Old Car Wheels, \$16.75 to \$17.25; Iron Axles, \$24 to \$25; Steel Axles, \$19 to \$20.

Caine & Plitt, dealers in Iron and Steel by-products, have removed their offices to 825, 826 and 827 Real Estate Trust Building.

Cincinnati.

FIFTH AND MAIN STS., December 11, 1901 (By Telegraph.)

With no material change in conditions the week closes on a strong and regular market. Trade is somewhat quiet, and not very many orders for over 1000 tons have been recorded, but there is a good run of minor transactions, making a fair tonnage in the aggregate. If there was any standard Iron for immediate delivery it would be taken at once in considerable quantities, but the market is barren in this line; indeed, Iron for next quarter's delivery is getting quite scarce with a good strong undertone. Holiday conditions will likely be the order of the market for the next few weeks. Higher prices are not immediately expected. Northern Irons are advancing a little ahead of Southern stock. Freight from Birmingham is \$2.75 to this point; from Hanging Rock district \$1.10. We quote, f.o.b. Cincinnati:

Southern Coke, No. 1.....	to \$15.00
Southern Coke, No. 2.....	to 14.25
Southern Coke, No. 3.....	to 13.75
Southern Coke, No. 4.....	to 13.25
Southern Coke, No. 1 Soft.....	to 15.00
Southern Coke, No. 2 Soft.....	to 14.25
Southern Coke, Gray Forge.....	to 13.25
Southern Coke, Mottled.....	to 13.25
Ohio Silvery, No. 1.....	\$15.60 to 16.10
Ohio Silvery, No. 2.....	15.10 to 15.60
Lake Superior Coke, No. 1.....	to 16.00
Lake Superior Coke, No. 2.....	to 16.10
Lake Superior Coke, No. 3.....	to 15.60
Southern Basic.....	to 14.75

Car Wheel and Malleable Irons.

Standard Southern Car Wheel, chilling grades.....	\$18.25 to \$18.75
Standard Southern Car Wheel, No. 2.....	17.25 to 17.75
Lake Superior Car Wheel and Malleable.....	18.50 to 19.00

Plates and Bars.—Market is quiet and unchanged. Iron Bars have been placed on the same basis as Steel Bars and are quoted f.o.b. Cincinnati as follows: Iron Bars in carload lots, 1.60c. to 1.65c., with half extras; same in small lots, 1.65c. to 1.80c., with full extras. Steel Bars are same price as Iron Bars. Base Angles, in carload lots, 1.90c.; Plates, ¼-inch and heavier, 1.90c. to 2c.; 3-16 inch, 2.10c.; Sheets, No. 16, 2.90c. to 3c.

Old Material.—New business is quiet, market is practically unchanged. We quote dealers' buying prices, f.o.b. Cincinnati, as follows: No. 1 Wrought Railroad Scrap, per net ton, \$14 to \$14.75; Cast Railroad and Machine Scrap, \$12.25 to \$12.75; Iron Axles, \$20 to \$20.50; Iron Rails, \$18.25 to \$18.50; Steel Rails, rolling mill lengths, \$14.75 to \$15.25; short lengths, \$13.75 to \$14; Car Wheels, \$16 to \$17. All prices except No. 1 Wrought on the basis of gross tons.

St. Louis.

CHEMICAL BUILDING, December 11, 1901.—(By Telegraph.)

Pig Iron.—While it is said an unusually good inquiry is in the Pig Iron market, with call for some large requirements, the volume of actual sales is considerably lighter, but this condition is the usual one at this period of the year. For some grades, for instance, Gray Forge and No. 4 Southern, a number of the furnaces are practically out of the market for an indefinite period, while in all other grades very light stocks for sale are reported to the sales departments here. These conditions, while they are gratifying to the furnaces, are not so advantageous to the commission men. The general conditions are summed up as very remarkable, with perhaps no time on record when a similar report could be made. A rumor, which is said to be well grounded, of an intended advance in freight rates south of the river is going the rounds of the trade, and a definite announcement is looked for at any time. We quote as follows for cash, f.o.b. St. Louis:

Southern, No. 1 Foundry.....	\$15.50 to \$15.75
Southern, No. 2 Foundry.....	14.75 to 15.00
Southern, No. 3 Foundry.....	14.25 to 14.50
Southern, No. 4 Foundry.....	13.75 to 14.00
No. 1 Soft.....	15.25 to 15.50
No. 2 Soft.....	14.75 to 15.25
Gray Forge.....	13.75 to 14.00

Bars.—Activity and strong demand still rule the day in the market for Iron and Steel Bars, and the mills appear to be well pleased with the progress of the market. Jobbers express a feeling of satisfaction with the existing conditions. We quote from mill: Iron Bars at 1.70c. to 1.80c., Steel Bars at 2c. Jobbers quote Iron Bars at 2c. to 2.10c., Steel at 2.10c. to 2.15c., full extras.

Rails and Track Supplies.—Nothing new of note or special interest can be brought to light this week in the Rail market, and we can merely reiterate our last report of a very strong and active demand. The demand for Track Supplies is heavy, with prices ruling as before. We quote: Splice Bars, 1.75c. to 1.95c.; Bolts, with Square Nuts, 2.75c. to 2.90c.; with Hexagon Nuts, 2.90c. to 2.95c.; Spikes, 2c. to 2½c.

Angles and Channels.—The same general tone and satisfactory conditions of trade are reported to exist in the market for Small Angles and Channels. Prices are unchanged. Jobbers quote at 2.30c., base, for materials of this class.

Sheets.—All sizes and classes of Sheets are in very good demand, and some of the mills are said to be well sold into the first quarter of the new year. Jobbers quote Stove Pipe size, No. 27, 3.45c. to 3.50c.; Galvanized Sheets, 65 and 10 off, and in round lots, 70 to 70 and 5 off.

Pig Lead.—The same order of conditions rule in the Pig Lead market with no change in the price-list. Soft Missouri from 4.25c. to 4.27½c., and Chemical at 4.30c. to 4.35c.

Spelter.—A quieter feeling is apparent in the Spelter market, and prices on lighter demand have reacted slightly, but hold very firm around present level, and 4.17½c. is bid.

William Burg Iron and Steel Agency of St. Louis, Mo., agents for Phillips, Nimick & Co., and Zug & Co., Limited, Pittsburgh, have removed their offices to more spacious and elegant quarters, 117 North Third street, ground floor of the Merchants' Exchange Building.

Birmingham.

BIRMINGHAM, ALA., December 9, 1901.

All during the past week the Iron market maintained the strength that has characterized it of late. If there is any change it has been toward a further hardening of the market. So, while there is no advance in quotations, they are stoutly adhered to, with plenty of buyers to take all they can get. And all they can get doesn't amount to much, for we are turning out a moderate amount only, and it is more than probable that this will be further decreased as we nearer and nearer approach the Christmas holidays. Then labor has its lay off and nothing can prevent it. The result is that production suffers. It would excite no surprise here if, for awhile, the output fell off one-half. Under these circumstances sellers are very conservative as to new business for the first quarter of 1902. There were no transactions the past week of magnitude save in Basic Iron. The seller had nothing to say concerning it, but your correspondent learned through well posted and reliable sources that the amount sold was 12,000 tons. The price obtained was \$12, and the delivery was scattered over the first half of 1902. Basic Iron runs the gamut of prices, from Gray Forge values to No. 1 Foundry. It soars and it flounders. Just now it is soaring. Market quotations are on the basis of \$11.50 for No. 2 Foundry, with No. 1 Foundry bringing \$12.50 for limited amounts. No. 3 Foundry readily sells at \$11 and the demand is beyond supply. One order for 2500 tons was scaled down by seller to 1500 tons and accepted. The buyer came back at once to supply deficiency with No. 4 Foundry, and duplicated the order, which seller declined, as his order book and furnace

capacity were too close to a balance. No. 4 Foundry and Gray Forge are each \$10.50. As to the volume of sales, it is unusually large for the season. In fact, the market, as a rule, takes a nap in December and awakes in January at the call of business. The furnace interests would enter no protest to a soporific spell long enough to let them even up sales and shipments. As to the outlook, there is a fear that we may have a runaway market if the demand continues, and (as has been heretofore) is only partly satisfied. That condition would be greatly deprecated by the Iron interests here. They want a demand that is steady and large enough to absorb output and at prices that will induce acceptance of tendered deliveries. It isn't often that sellers of commercial commodities object to or oppose high prices, but that feeling is dominant here as to Iron. Circumstances strongly point to a further advance and it is almost universally conceded as likely to occur. But at \$12 for No. 2 Foundry the market would be liberally fed for all acceptable deliveries. Mutually acceptable deliveries seems now to be the key to the situation.

There is some let up in the car famine so far as Iron is concerned, but requisitions for cars are only partly filled as yet, and for some time to come this will be the case. The relief so far afforded to the Coal interests in this respect is as "a drop in the bucket." At least half the time the mines are shut down or running on half time.

There is nothing new obtainable about Steel. The mill is running on business already booked, and it is of magnitude sufficient to keep it employed for a long period.

There have been further incorporations of Coal companies. Among the more important of them are the North Alabama Coal & Coke Company, capitalized at \$100,000, and the Lehigh Coal Company, capitalized at \$50,000. Each has the usual liberal charter.

To-day the Electric Railway Company commenced to change the dummy system to Bessemer into the trolley system. This involves the relaying of the road with heavier Rails and a general reconstruction. At no period in the history of Birmingham has confidence in her future been so great as it is now, and never has there been a more earnest investigation for opportunities that promise favorable results. At present we are flying high, with every indication of soaring still higher.

Pittsburgh.

HAMILTON BUILDING, December 11, 1901.—(By Telegraph.)

Pig Iron.—The Steel Corporation have bought something over 20,000 tons of Bessemer Iron from the Furnace Association at \$15.25, at Valley furnace. This, however, is absolutely minimum of the market, as sales of Bessemer Iron, and in fairly large lots, have been made at \$15.75 and up to \$16 at furnace. Bessemer Iron for delivery in first half of next year has sold in large lots at \$15.50, at furnace. There is a scarcity of Bessemer Iron for prompt shipment, and sellers can get almost any price they ask. Forge Iron is very firm, and the Valley furnaces have little to spare, and are not quoting. Standard brands are \$15 to \$15.25, Pittsburgh. Foundry Iron is also active, and prices are higher. No. 2 for prompt shipment has sold at \$16, Pittsburgh. We quote Standard Bessemer Iron from association furnaces, \$15.25, while outside furnaces are selling at \$15.75 to \$16, at furnace. We note a sale of 3000 tons of Standard Bessemer Iron at \$15.75, Valley furnace, for prompt delivery, and also a sale of 10,000 tons for first six months at \$15.50, at Valley furnace. It is said that some of the furnaces of the association insist that the Steel Corporation will have to pay higher prices for Iron. We quote Gray Forge, \$15 to \$15.25, Pittsburgh, and note sales of 3000 to 4000 tons at these prices. No. 2 Foundry is \$16 to \$16.25, and No. 1, \$16.50 to \$16.75, f.o.b. Pittsburgh. There have been heavy purchases of Foundry Iron by some of the largest foundries, and for delivery running all through next year. Some of the furnaces that run on Foundry Iron report they are pretty well sold up for first half.

Steel.—There have been sales recently of good sized lots of Steel at \$27.50 and up to \$28, Pittsburgh. Most of the business, however, is in small lots, as prices are so high there is not much incentive for consumers to take hold for next year. Sales of 8000 to 10,000 tons are reported at above prices. However, some of the largest consumers of Steel are being supplied on a conversion basis, which brings the price very much lower than is being paid for prompt Steel. Sheet Bars are held at \$28 to \$29, depending on the tonnage and delivery wanted. The Shenango Furnace Company will not build a Steel plant at Sharpsville, as reported.

Coke.—The output of Coke in the Connellsville region last week was 236,000 tons, and shipments 10,500 cars. Prices of strictly Connellsville Furnace Coke, on contracts for next year, will be from \$2.10 to \$2.25. Seventy-two hour Foundry is \$2.35 to \$2.50 at oven. Some of the Valley furnaces have already made their contracts for Coke for first six months.

(By Mail.)

The two principal events of interest in the Iron trade since our last report are the fixing of Ore prices for next year on the same basis as this season, which is \$4.25, lower lake ports, for old range Ores. This ought to give a stability to the Pig Iron market for the first half of the year at least. The other event is the renewal for another year of the Beam and Plate Associations, both of which expire by limitation at the first of the year. The car situation is reported by the mills as somewhat better than a week ago, but is still far from being satisfactory. It is not a question of getting orders to run the mills, but of finding cars to ship out the product. There have been further purchases of Bessemer and Basic Iron by the Steel Corporation, at \$15.25 for the former and \$15 for the latter, Valley furnace. These prices, however, are absolutely minimum of the market, and we can state positively that Bessemer Iron for delivery in first half of next year has sold at \$15.50, Valley furnace, while small lots of Bessemer and Basic Iron for spot shipment have sold at \$15.75 and up to \$15.90, at furnace. There continues to be a wide range in prices of Steel, prices depending altogether on the buyer, the amount of tonnage in the order and deliveries wanted. Steel for next year on contracts can be bought at about \$25, at mill, by consumers who have been purchasing steadily from the same source. Small lots of Billets for prompt shipment are quoted at \$28 to \$28.50, maker's mill. In Finished Iron and Steel there is no change in prices and demand keeps up remarkably well for this season of the year. There have been some good sized contracts for Coke placed for next year at prices ranging from \$2.15 to \$2.25, at oven. The Coke trade for this year will surpass all previous years, both as regards output of the ovens and prices obtained.

Ferromanganese.—The syndicate price of Domestic 80 per cent. Ferro is \$52.50 to \$53.50, f.o.b. cars, Pittsburgh. Owing to bad condition of the Iron trade in England and Germany, a good deal of Foreign Ferro is being offered in this market, and it can be laid down at about \$50 a ton in large lots, f.o.b. cars, Pittsburgh. Some of the largest consumers of Ferro have not yet contracted for their next year's supply.

Muck Bar.—There is not much inquiry for Muck Bar, and we quote the market for Standard grades at \$29.25 to \$29.50, Pittsburgh. We note a sale of about 2000 tons at the first named price. Eastern Muck Bar can be laid down in this market at about \$28.75 a ton, but usually sells from 75c. to \$1 a ton below the price of local Bar.

Rods.—The Rod market is quiet and a good many Rods are being offered, with the result that prices are not as firm as they have been. We quote Bessemer Rods at \$32.50 to \$33, Pittsburgh, and note that for a large order and desirable specifications the lower price might be shaded.

Steel Rails.—The official statement that up to December 1 the Rail mills had booked orders for 1,368,000 tons, not including Girders, or held over tonnage from this year, is one of the strongest arguments for a good Steel business for next year. No foreign business is being done, as the Rail mills cannot meet domestic demand, nor could they compete with low prices ruling on the other side. We quote \$28, at mill.

Plates.—The Plate Manufacturers' Association, which expires by limitation January 1, has been renewed for another year. However, the attempt to consolidate Lukens, Tidewater, Central and Worth Brothers has been given up, as differences arose which could not be adjusted. Now that the Plate agreement has been renewed for another year, it ought to give more confidence in the market and tardy buyers of Plates, that have been holding off from buying, are expected to come into the market and place their contracts. There has already been an improvement in demand for Plates, some large orders having been placed by the Steel Car people, and also by the shipbuilding interests. There has also been a betterment in general demand. No change was made in prices at the meeting of the Plate Association held last week, when the agreement was renewed for another year, and we quote as follows: Tank Plate, $\frac{1}{4}$ inch thick and thicker, up to 100 inches in width and under, 1.60c. at mill, Pittsburgh; Flange and Boiler Steel, 1.70c.; Marine, Ordinary Fire Box, American Boiler Manufacturers' Association specifications, 1.80c.; Still Bottom Steel, 1.90c.; Locomotive Fire Box, not less than 2.10c., and it ranges in price to 3c. Plate more than 100 inches wide, 5c. extra per 100 lbs. Plate 3-16 inch in thickness, \$2 extra; gauges Nos. 7 and 8, \$3 extra; No. 9, \$5 extra. These quotations are based on carload lots, with 5c. extra for less than carload lots; term, net cash in 30 days.

Structural Material.—At a meeting of the six mills composing the Beam Association, held last week, the agreement was renewed for another year. Reports showed that this year beat all records in tonnage, and the outlook for next year is excellent. Some of the Eastern mills urged an advance in prices, but this was opposed by other interests, who argued that the present price allowed a fair margin of profit and to put it any higher might shut off demand to some extent. A good deal of tonnage is being placed and the material for a new custom house in New York City, about 10,000 tons, may be given out this week. Many small orders are being placed, which aggregate a heavy tonnage. There is no change in prices whatever, and we quote: Beams and Channels, up to 15-inch, 1.60c.; over 15-inch, 1.70c.; Angles, 3 x 2 up to 6 x 6 inches, 1.60c.; smaller sizes, 1.55c. to 1.60c.; Zees, 1.60c.; Tees, 1.65c.; Steel Bars, 1.50c., half extras, at mill; Universal and Sheared Plates, 1.60c. All above prices are f.o.b. Pittsburgh.

Spelter.—We quote prime Western grades of Spelter at 4.15c. to 4.20c., Pittsburgh.

Merchant Bars.—There is a moderate volume of business being placed, but some large buyers are understood to be holding off until after the first of the year before placing contracts. Some of the Bar mills have pretty well caught up with orders and can make reasonably prompt delivery. The agreement on Steel Bars was renewed last week, but no change was made in prices. It is possible some of the jobbers may be cutting to some extent, but the mills in the association are adhering rigidly to fixed prices. We quote Steel Bars at 1.50c. at mill, half extras, with \$2 a ton advance for Open Hearth stock and the usual advances for special shapes. We quote Iron Bars at 1.55c., Pittsburgh, for Eastern shipment and 1.50c. for Western shipment.

Sheets.—A good many contracts are being placed, in some cases deliveries on these running through first half of next year. A good deal of new Sheet capacity is coming into the market and some of the mills are going after orders very aggressively. We quote Black Sheets, Box Annealed, one pass through cold rolls, as follows: Nos. 10, 11 and 12, 2.40c.; Nos. 14 and 15, 2.50c.; Nos. 16 and 17, 2.60c.; Nos. 18 to 21, inclusive, 2.70c.; Nos. 22, 23 and 24, 2.80c.; Nos. 25 and 26, 2.90c.; No. 27, 3c.; No. 28, 3.10c.; No. 29, 3.25c.; No. 30, 3.35c. For good orders Sheets can be bought on the basis of 2.80c. for No. 26, 2.90c. for No. 27 and 3c. for No. 28. Small Lots of Sheets bring about 3.10c. for No. 27 and 3.15c. for No. 28. We quote Galvanized Sheets at 70 and 5 off in carloads and 70 off in small lots, maker's mill.

Merchant Steel.—Buyers are holding off placing orders until after the first of the year. The mills are pretty well filled up and the situation is not likely to

show much change for some time. Some of the large Implement makers are expected to come in the market early in January and place heavy contracts. We quote: Tire Steel, best quality, 1.70c.; Toe Calk, 1.80c. to 1.85c.; Hammered Lay Steel, 3.50c.; Open Hearth Spring, 2.50c. to 2.75c.; Steel Bars, 1.50c., base, in carloads, and 1.60c. in small lots; ordinary Plow Slabs up to 6 inches wide, 2.25c.; over 6 inches wide, 2.40c. For ordinary orders we quote Cold Rolled and Cold Drawn Shafting at 60 per cent. off in carloads and 55 per cent. off in less than carloads, delivered at all points east of the Mississippi River. We quote Tooth Steel at 6c. and upward, depending on quality.

Iron and Steel Scrap.—Buying has fallen off to some extent and the situation will likely be quiet until after the first of the year. Consumers have failed to reach an agreement on policy in buying, and it is not believed the several plans have proved feasible. Heavy Melting Stock is held at \$17.50 to \$18 gross ton; Low Phosphorus Melting Stock, \$18.50 to \$19; No. 1 Wrought Scrap, \$17 net ton; Iron Rails, \$21.50 to \$22 gross ton.

Skelp.—The Skelp market continues quiet and very little buying is being done. None of the large consumers are in the market, but it is thought the quietness is only temporary and that there will be some buying shortly after the first of the year, if not before. We quote Grooved and Sheared Steel Skelp at 1.70c. to 1.75c. Grooved Iron Skelp is 1.72 $\frac{1}{2}$ c. to 1.77 $\frac{1}{2}$ c., and Sheared 1.80c. to 1.85c., f.o.b. maker's mill, less 2 per cent. off for cash in 30 days from date of shipment. We note that some mills are quoting higher prices than the above for Steel Skelp.

Merchant Pipe.—Demand has fallen off a good deal, but the mills are pretty comfortably filled up on all contracts. Several new Pipe mills are hunting trade very vigorously, and existing prices are being shaded in some cases. However, the tone of the market is fairly firm. Prices to consumers in carloads are as follows:

Merchant Pipe.		Per cent.	Per cent.
		Black.	Galvd.
$\frac{1}{4}$ to $\frac{1}{2}$ inch and 11 to 12 inch.....		61	48
$\frac{3}{4}$ to 10 inch.....		68 $\frac{1}{2}$	56
Casing, Random Lengths.		S. & S.	I. J.
2 to 3 inch.....		58	53 $\frac{1}{2}$
3 $\frac{1}{4}$ to 4 inch.....		63	59
4 $\frac{1}{4}$ to 12 $\frac{1}{2}$ inch.....		65	61 $\frac{1}{2}$
Casing, Cut Lengths.		S. & S.	I. J.
2 to 3 inch.....		58 $\frac{1}{2}$	59
3 $\frac{1}{4}$ to 4 inch.....		59	55
4 $\frac{1}{4}$ to 12 $\frac{1}{2}$ inch.....		61 $\frac{1}{2}$	57 $\frac{1}{2}$

Prices to jobbers are from 5 to 7 $\frac{1}{2}$ per cent. lower than the above.

Boiler Tubes.—Some heavy buying in Boiler Tubes is being done by locomotive builders and the outlook is that consumption of Tubes will be greater for some time than the output. The leading interest and other mills making Boiler Tubes are now two to three months behind on contracts. The market is very firm and the prices to consumers are as follows:

Boiler Tubes.		Up to 22 feet.
		Per cent.
Steel.		
1 inch to 1 $\frac{1}{2}$ inch and 2 $\frac{1}{2}$ inch to 5 inch, inclusive....		65 $\frac{1}{2}$
2 inch to 2 $\frac{1}{2}$ inch, inclusive.....		60
6 inch and larger.....		59
Iron.		
1 inch to 1 $\frac{1}{2}$ inch and 2 $\frac{1}{2}$ inch.....		43 $\frac{1}{2}$
1 $\frac{1}{2}$ to 2 $\frac{1}{2}$ inch.....		43
2 $\frac{1}{2}$ to 13 inch.....		53

Cleveland.

CLEVELAND, OHIO, December 10, 1901.

Pig Iron.—There is an unprecedented demand for Foundry Pig Iron and the supply is becoming shorter all the while. Prices are running away with the market, as this week saw another advance of 50c. on the ton in the Valley. Those who have Foundry No. 2 for immediate delivery are asking and obtaining \$15.50 in the Valley, although contracts for delivery during the first half of the year are made on the basis of \$15 in the Valley. Most of the Iron for December shipment has been disposed of and most of the stock piles have been so depleted as to make any extensive shipment

from them impossible. The car shortage is still most annoying, and although the season of navigation on the lakes is about over, at which time some relief was expected, no change is noticeable in the situation. The supply of coke is still very short and the action of the furnaces is impaired. At the same furnacemen are unable to make deliveries even after the Pig Iron has been produced. Bessemer Pig is still being sold at \$15.25, regardless of the fact that the demand for the material would seem to indicate very strongly the possibility of obtaining better prices. Most of the Iron for January delivery has now been contracted for and the prospects are that sales will presently be made for February delivery. There is hardly a possibility that the prices for February, or, in fact, through the first half of the year, will be changed from the present basis of \$15.25 in the Valley. Basic is bringing \$15 in the Valley, at which price contracts have been made which entail deliveries during the first half of next year. In both Bessemer and Basic the available supply for shipment this year has been contracted for, and it is impossible to obtain deliveries on orders placed at this time inside of three or four weeks.

Finished Material.—The Plate Association held a meeting during the week and reaffirmed the present prices for the coming year. This is looked upon as abolishing the only weak indication in the market. When the demand fell away on Sheared Plates it seemed for a while that the price must break, but the shipbuilding companies and the car factories became more active during the last few weeks and the trade has been steadily picking up. Plates are therefore still quoted at 1.70c. on the Cleveland market. Deliveries are now promised in three or four weeks. On Structural Material deliveries are not offered now before February 15, and even that far ahead the material is getting scarce. The contracting has been extended during the last few days to include the first half of the year, and the tonnage has been very large. The prices do not change from 1.70c. on Beams, Angles and Channels. It is proving a most difficult task to keep the ordering on Bars up to the production of the mills, since Bars are so easy to make and the plants engaged are so numerous. The market is holding its own, however, although there is a constant fear of weakness. The mills are in shape to make prompt deliveries on Bars and the price does not change from that recently quoted. Iron Bars are bringing 1.50c., Pittsburgh; Steel Bars, Bessemer, 1.50c., Pittsburgh; Open Hearth Steel Bars, 1.60c., Pittsburgh. Sheets are still very active, with some of the gauges growing more scarce all of the time. As a general thing the market is in a very fair state, with prices stable. On Billets the larger mills are announcing that they have no material for sale for the first half of next year, being entirely off of the market. Those who need the material are driven to extraordinary extremes now. Rails are still quoted at \$28, with but little business going, as most of the material has been sold up so far ahead as to quiet the market down some.

Old Iron.—The Scrap trade has been very steady this week, with a good run of business, but nothing of a surprising or sensational nature. Prices are steady, as follows: No. 1 Wrought, \$16.50 net; Cast Borings, \$8 gross; Wrought Turnings, \$12.25 gross; Cast Scrap, \$13 net; Stove Plate, \$10 net; Heavy Steel, \$17 gross; Steel Rails, \$17; Old Iron Rails, \$22 gross; Old Iron Axles, \$19 gross; Old Car Wheels, \$17 gross.

New York.

NEW YORK, December 11, 1901.

Pig Iron.—The market has been quiet and firm, no large transactions being noted in this district. We quote: No. 1, \$16.35 to \$17.50; No. 2 X, \$15.65 to \$16; No. 2 Plain, \$15.15 to \$16; Gray Forge, \$14.65; Tennessee and Alabama brands, No. 1 Foundry, \$16; No. 2 Foundry, \$15.25; No. 1 Soft, \$16; No. 2 Soft, \$15.25; No. 3 Foundry, \$14.75; No. 4 Foundry, \$14.25; Gray Forge, \$14.25.

Steel Rails.—Among the contracts recently placed are two lots aggregating 55,000 tons for the Baltimore &

Ohio Railroad. We continue to quote Standard Sections at \$28 at Eastern mill.

Finished Iron and Steel.—Building continues very active in this city. Among the larger contracts placed this week is that for the Newtown Creek bridge. Prices are quoted as follows at tidewater: Beams, Channels and Zees, 1.75c. to 1.80c.; Angles, 1.75c. to 1.80c.; Tees, 1.80c. to 1.85c.; Bulb Angles and Deck Beams, 2c.; Sheared Steel Plates are 1.80c. to 1.85c. for Tank, 1.90c. to 1.95c. for Flange, 2c. to 2.05c. for Fire Box. Charcoal Iron Plates are held at 2.40c. for C. H. No. 1, 2.90c. for Flange, and 3.40c. for Fire Box. Refined Bars are 1.65c.; Soft Steel Bars, 1.70c.

Metal Market.

NEW YORK, December 11, 1901.

Pig Tin.—Business throughout the week has been quiet. The market has been in the buyers' favor, but consumers showed no inclination to engage. After the rapid declines of last week a slight reaction set in, prices advancing as high as 25¼c. for spot. At the close to-day the market was weak and quotations were as follows: Spot, 25¼c., sellers; December, 24¼c. to 25c.; March and April, 23¼c., sellers. London closed £110 15s. for spot and £104 10s. futures. These figures are practically unchanged from last week.

Copper.—That certain large consumers and the principal producers are most anxious to do something to bring about a termination of the present demoralized conditions is very evident. The producers want to get out of the thing as nicely as possible, and consumers want to see a steady, stable market. It is safe to say, however, that as yet there is no sign of any settlement between these parties. Production is going right on, and consumption is only according to the actual needs of the purchasers. Rumors of all sorts emanating from Wall Street and Boston have become so common that those of last week commanded no attention in the trade and of course proved to be worthless. As to actual conditions there is no change. Quotations are entirely nominal and are as follows: Lake, 16½c. to 17c.; Electrolytic, 16½c. to 16¾c.; Casting, 16c. The London market continued to decline and heavy sales were reported. To-day at the close spot was quoted £54 7s. 6d. and futures £54 5s. This is a break of almost £1 as compared with last week. Best Selected also declined sharply during the week. The drop amounted to £1½, the quotation being £68 10s.

Pig Lead.—Notwithstanding the announcement that an agreement has been arrived at between the American Smelting & Refining Company and the miners, it is stated in the trade on good authority that the miners have not agreed to curtail production. It is held that, while the conference may be over, an agreement has not been reached, and especially an agreement that will tend to better the situation. Market conditions remain unchanged. The American Smelting & Refining Company continue to quote Desilverized at 4.37½c., New York, and 4.32½c., St. Louis. London reached the lowest point of many years with £10 15s.

Spelter.—Spot is considerably higher here. Business is said to be good. Spot is held at 4.45c. St. Louis is quoted 4.17½c. London did not seem to take any stock, however, in the American advance, and instead of advancing, declined 5 shillings, coming at the close to-day £16 5s.

Antimony.—Is unchanged. Hallett's is quoted 8¾c. Cookson's is unchanged, being held nominally at 10¼c. Outside brands declined to 8c. to 8¼c.

Nickel.—Is unchanged, prices continuing on a basis of 60c. for lots not covered by yearly contract.

Quicksilver.—There is no change here. The price is \$51 per ask of 76½ lbs., in lots of 50 flasks and more. London has declined 2 shillings 6 pence, to £8 17s. 6d.

Tin Plates.—The situation is unchanged. The American Tin Plate Company are selling only for the first quarter of next year on a basis of \$4.19 per box of standard 100-lb Cokes, f.o.b. New York, and \$4 f.o.b. mills.

The New York Machinery Market.

NEW YORK, December 11, 1901.

Nothing has developed to change the condition of business. The demand in general lines is keeping up well and current business is unusually active for this time of the year. Inquiry is keeping up in excellent fashion and prices are unchanged. The customary slackening of demand which accompanies this season of the year and which is usually looked for about this time is not so noticeable as might be expected.

Merchants here are very much gratified at the manner in which business is keeping up in

Machine Tools.

Principal interest in large propositions now before the trade takes the direction of the prominent railroads in this vicinity. There are several good lists out on which bids have been submitted and which are momentarily expected to be closed. The largest of these are issued by the Erie, Lehigh Valley, New York, New Haven & Hartford, Philadelphia & Reading and the New York Central systems.

A list which we are reliably informed will foot up to over \$150,000 is now being prepared by Hooven, Owens & Rentschler of Hamilton, Ohio. As we have previously stated, this concern are to branch out very extensively and will triple the capacity of their shops. They build Corliss engines, and a good deal of the equipment ordered will be heavy tools. Special tools designed for engine building will be employed wherever desirable.

The Lidgerwood Mfg. Company of Brooklyn, N. Y., are purchasing heavily for the equipment of a new boiler shop. It will be 70 x 280 feet, and will have three lines of cranes. The equipment for furnishing the power has been secured. It will consist of Allis engines, Lidgerwood boilers and General Electric generators.

An addition is to be built to the new works of the Babcock & Wilcox Company, at Bayonne, N. J. The new building is to be a drum shop, 45 x 320 feet. The matter of machinery equipment is now in hand. H. F. De Puy, the secretary, has the matter in charge.

The Fifield Tool Company of Lowell, Mass., who were recently burned out and decided to rebuild, will be in a position to take care of new business about January 1. The large new works contemplated will, however, not be finished by that time.

Flather & Co., the well-known builders of machine tools of Nashua, N. H., are the latest of the old machinery concerns to avail themselves of the advantages of incorporation. The proper style of the firm now is Flather & Co., Incorporated. We are advised that the new company will carry on precisely the same line of manufacture as heretofore in the same shops.

A report, which it appears was premature, gained considerable attention in the trade during the last week. It was to the effect that Arthur Sewall & Co., shippers and shipbuilders of Bath, Maine, were about to enlarge their plant. The firm write us that the report is premature, and that no plans have been made as yet for the new machine shop.

It is not generally known in the trade that a considerable amount of special machinery for installation in the new British Westinghouse works is being built in the American Westinghouse works. In this connection the following note which we received from Pittsburgh is interesting: "About 300 employees of the British department of the works of the Westinghouse Electric & Mfg. Company, at East Pittsburgh, received notice last week that they would have to work overtime until the tools, which are being made in this department for the British Westinghouse Company, Limited, plant, in Manchester, England, are completed. The British department, as it is termed by the company, is devoted exclusively to manufacturing tools and implements to be used in the Manchester plant."

Purchases are now being made by the New Castle Forge & Bolt Company, who are erecting a new plant at New Castle, Pa. Large machinery contracts have just been placed with the Acme Machinery Company of Cleveland, Ohio, and the National Machinery Company of Toledo, Ohio.

Charles A. Singer, president of the New York & Stamford Railway Company and the Greenwich Tramway Company, of Port Chester, N. Y., informs us that machine tools, &c., are desired for installation in new machine shops and wheel lift for wheel pits which the company are to erect at Port Chester. The improvements at that point consist of a large car barn with general repair shops. These buildings will be 76 x 200 feet and 30 x 130 feet respectively.

We are informed by the Union Steam Specialty Company of Scranton, Pa., and 126 Liberty street, New York, that they are contemplating very extensive improvements to their plant. The company build steam pumps, indicators, reducing wheels, steam separators, blowers, oil contractors, mining and engineers' supplies, &c. Very recently the Scranton plant has been doubled in capacity. Now it is intended to further enlarge the works. When plans for this work are completed an entirely new steam plant and metal working machinery of all kinds will be required. At present the company are in the market for a 10-ton traveling crane, 50 feet span. They advise us that sole agencies are to be given to dealers in every city of size throughout the country for the sale of their pumps and steam specialties. Extensive orders for the Lippincott steam separator, which is one of the products of the concern, have been recently secured in Sweden, South Africa and South America.

The Century Machine & Mfg. Company of Mansfield, Ohio, are inquiring in the trade for machine tools and cranes. The company are making extensive additions to their plant, but active building operations will not proceed until next spring. The concern inform us that they will add a large erecting room, structural shop, foundry, pattern shop and blacksmith shop. Purchases of planers and boring mills have already been made. The company will be in the market shortly for a 10-ton and a 15-ton traveling crane and a large quantity of machine tools. W. C. Lloyd is president of the company. Besides general machinery the concern manufacture mechanical stokers.

Plans are being prepared for the erection of a new plant by the Sirius-American Gas Machine Company of Springfield, Mass. John Aldrich, attorney of Springfield, is at present the representative of the company. It is a new concern, just having been incorporated for the purpose of manufacturing and selling the "Sirius" air gas automatic gas producer. The apparatus is of foreign origin and the American concern have arranged to build and market it in this country. Mr. Aldrich writes us that definite plans for the new works have not been completed as yet. The directors of the company are: James B. Mumford, president; Thomas H. Benton, vice-president; Horace W. Bullock, secretary-treasurer; John Aldrich, counsel; John S. Livingstone, James E. Smith, all of Springfield, Mass., and Gustav Steinberg of Holyoke.

Boilers and Engines.

Strange though it may seem, the largest new work now on the tapis is for installation in a department store. This fact does not, however, reflect on the size of the job, for it is to be a 3000 horse-power plant. The George H. Fuller Construction Company of 137 Broadway are placing the contracts. R. H. Macy & Co. are the owners. It is reported in the street that the boiler order was awarded to the Babcock & Wilcox Company, but at the offices of the purchasers it was stated to-day that the matter had not been decided upon. Besides boilers and engines there will be a large quantity of heating, ventilating and conveying machinery.

The Union Bag & Paper Company of Sandy Hill, N. Y., have just placed their boiler order with Thayer & Co., Incorporated, of 39 Cortlandt street. There are to be six 300 horse-power units. Engines and stokers have not been purchased as yet.

The Bergen Turnpike Company, in which David Young is the principal, are making additions to their electric plant at Secaucus, N. J. They have ordered four 250 horse-power Babcock & Wilcox boilers. From the Green Fuel Economizer Company of 74 Cortlandt street, New York, they purchased a fuel economizer plant to

take care of the entire boiler capacity. The Alphonse Custodis Stack Company received an order for a 175-foot stack.

The Tartar Chemical Company of Brooklyn placed an order with Hooven, Owens & Rentschler of 39 Cortlandt street for a 400 horse-power simple engine.

The Detroit Stove Works of Detroit, Mich., who are extending their plant considerably, have closed a contract with the Westinghouse companies for a 350 and a 160 horse-power compound engine, direct connected to alternating current generators. Westinghouse, Church, Kerr & Co. of 26 Cortlandt street, New York, closed the deal.

The 300 horse-power gas engine which was exhibited at the Pan-American Exposition by the Westinghouse Machine Company, and which attracted a great deal of attention owing to its unusual size, has been sold. The United Coke & Gas Company of Philadelphia purchased it and will install it in their plant at Camden, N. J.

Miscellaneous.

We are officially advised that the plans for the consolidation of certain pneumatic tool and allied interests are complete. The new company will not take over all of the pneumatic tool manufacturers, as was first expected, but will include only the various concerns in which J. W. Duntley, the founder of the Chicago Pneumatic Tool Company, is prominent, and the Chisholm & Moore Mfg. Company of Cleveland, Ohio. Filing of the charter and actual work of organization have been deferred until after the holiday season. Everything may be in shape in time for the new concern's commencing business with the first of next year. J. W. Duntley is to be the head of the concern, but the names of those to be prominently affiliated with him have not been announced as yet. The new company are to include the following concerns: The Chicago Pneumatic Tool Company of Chicago and New York, The Boyer Machine Company of Detroit, the new Tate, Howard Company of Manchester, England; the Chisholm & Moore Mfg. Company of Cleveland, Ohio, and the Franklin Air Compressor Company of Franklin, Pa., who carry with them the New York Air Compressor Company of New York. The latter concern act as the selling agents for the Franklin Company. The new company are to manufacture every sort of pneumatic appliance, from the compressor to the numerous forms of lifts, cranes and pneumatic tools. While not officially stated, it is generally reported that the company are to be capitalized at \$10,000,000.

As an advance guard of the resumption of industrial activity in South Africa Gardner F. Williams, president of the De Beers Consolidated Mines of Kimberly, South Africa, is now in this country purchasing machinery and equipment for the rehabilitation of the company's properties. Mr. Williams is stopping at the Waldorf-Astoria, New York. One of his first purchases here was two 1000 kw. Westinghouse-Parsons steam turbines. These machines are to be direct connected to alternating current generators. They will be the first steam turbines ever exported from this country. Mr. Williams has also ordered an extensive installation of pneumatic tools. The Chicago Pneumatic Tool Company obtained the order.

The Crescent Paper Company of Troy, N. Y., are planning for extensive improvements to their plant. The company have just entered corporate existence with an enlarged capital for the purpose of extending the scope of the old concern, who held the same name as the new, but were conducted as a private enterprise. The new officers are Herbert R. Mann, president; Chas. R. Beck, vice-president and treasurer, and Geo. E. Goddard, secretary.

We are officially advised that very extensive additions will be made to the packing plant of the Schwarzschild & Sulzberger Company at Forty-fifth street and First avenue, New York. Electrically operated machinery will be installed throughout and the improvements will cost about \$850,000. Chief Engineer Wilder of the company will be in this city within about three weeks and will then prepare the plans for the work. Officers of the company have been in New York for several days past and it has been definitely decided that the work should be commenced as soon as possible.

Naval Supplies.

PUGET SOUND.

Following are the bids opened at the Bureau of Supplies and Accounts, Navy Department, for the machinery section of the supplies for the Puget Sound Navy Yard:

- Bidder 2. New Jersey Foundry & Machine Company, 26 Cortlandt street, New York City.
- 4. Prentiss Tool & Supply Company, 115 Liberty street, New York City.
- 5. Manning, Maxwell & Moore, 85 Liberty street, New York City.
- 6. Morgan Engineering Company, Alliance, Ohio.
- 7. Pawling & Harnischfeger, Milwaukee, Wis.
- 8. Northern Engineering Works, Detroit, Mich.
- 18. Parke & Lacey Company, 41 Fremont street, San Francisco, Cal.
- 22. A. Baird Machinery Company, Pittsburgh, Pa.
- 25. Niles Tool Works Company, Hamilton, Ohio.
- 27. Drew Machinery Agency, Manchester, N. H.
- 28. Henshaw, Bulkley & Co., Fremont and Mission streets, San Francisco, Cal.
- 33. Pacific Tool & Supply Company, 102 First street, San Francisco, Cal.
- 34. Pratt & Whitney Company, Hartford, Conn.
- Class 22. One 10-ton electric traveling crane—Bidder 7, \$3500 and \$4000; 4, \$4148; 8, \$4257; 6, \$4596 (?); 5, \$4785; 2, \$4900; 25, \$5330.
- Class 23. One 6-spindle not tapping machine—Bidder 5, \$650; 28, \$585 and \$670.
- Class 24. One nut milling machine—Bidder 34, \$715; 5, \$1825.
- Class 25. One nut fastening machine—Bidder 28, \$320, \$385 and \$440; 5, \$468; 27, \$717.
- Class 26. One bolt pointing machine—Bidder 5, \$285; 28, \$256 and \$290; 18, \$331; 22, \$365; 27, \$375 and \$338.
- Class 27. One tool room lathe—Bidder 38, \$425; 28, \$455; 33, \$468; 34, \$514.
- Class 28. One magnetic iron and brass turning separator—Bidder 22, \$214; 33, \$260; 28, \$312.

MANILA COALING PLANT.

Bids were opened December 3 at the Bureau of Equipment, Navy Department, for the construction of a coaling plant at Manila Bay, as follows:

- Atlantic, Gulf & Pacific Company, San Francisco, Cal.: Plan A, item 1a, \$759,730; 1b, \$734,730; 1c, \$739,230; 2a, \$456,365; 2b, \$443,865; 2c, \$446,115. Plan B, item 3a, \$757,730; 3b, \$732,730; 3c, \$737,230; 4a, \$455,365; 4b, \$442,865; 4c, \$445,115; alternate to rail pile wharf deduct \$15,000.
- Snare & Triest, New York, N. Y.: Item 1, \$1,258,600; a, deduct \$1150; b, add \$63,000; c, add \$18,000; d, add \$103,000; e, add \$46,000; f, add \$4000; g, deduct \$12,000; h, add \$73,000; i, deduct \$11,000. Item 2, \$752,500; a, deduct \$600; b, add \$63,000; c, add \$9,400; d, add \$103,000; e, add \$23,200; f, add \$4000; g, deduct \$19,000; h, add \$3600; i, deduct \$6000. Item 3, \$1,395,000; a, add \$8500; b, add \$26,700; c, add \$56,000; d, add \$83,000; e, add \$12,000; f, add \$19,700; g, add 12,000. Item 4, \$953,700; a, add \$85,000; b, add \$15,300; c, add \$33,000; d, add \$42,000; e, add \$63,000; f, add \$19,700; g, add \$8000. Item 5, \$1,328,000; a, add \$85,000; b, add \$24,600; c, add \$50,000; d, add \$8300; e, add \$12,000; f, add \$23,300; g, deduct \$12,000. Item 6, \$877,400; a, add \$8500; b, add \$13,300; c, add \$27,000; d, deduct \$4200; e, add \$6300; f, add \$23,300; g, deduct \$8000. Item 7, \$467,300; a, add \$75,000; b, add \$3600; c, add \$8000; d, add \$27,600; e, deduct \$4000. Item 8, for each coal shed deduct \$75,000. Item 9, \$14,000; 10 galvanized wire nets in frames between tunnels of building, 20 cents per square foot.

A serious accident occurred at the blast furnace of the Sharon Steel Company, Sharon, Pa., on Tuesday, December 10, by which nine men were seriously burned. The furnace had resumed blast only a few days before, but was not badly damaged.

The recent addition of \$1,000,000 to the capital stock of the Youngstown Iron Sheet & Tube Company, Youngstown, Ohio, has all been paid in, giving the concern a paid up capital of \$2,000,000. Plans are being drawn for an open hearth steel plant, work on which will start in a short time.

The Fort Pitt Malleable & Gray Iron Casting Company have commenced active work on their new plant at McKee's Rocks, Pittsburgh. The Pittsburgh Construction Company are putting up the buildings, one of which will be 65 feet wide and 450 feet long, and the other 50 feet wide and 135 feet long. The product of the plant will be malleable and gray iron castings and forgings.

The Alberger Condenser Company.

The Alberger Condenser Company have been organized with Louis R. Alberger as president, George Q. Palmer as vice-president, B. W. Pierson secretary and treasurer, D. H. Chester and George P. Symonds, an office having been established at 95 Liberty street, New York.

The general management of the company is directed by Louis R. Alberger, who was formerly connected with Henry R. Worthington, New York, and for 13 years was in charge of the condenser department of that company. His associates were also with Henry R. Worthington for periods of from seven to 20 years. The vice-president, George Q. Palmer, is manager of the Quintard Iron Works of New York, an old and well-known concern, with an equipment exceedingly well suited for the manufacture of the special machinery required.

The Alberger Condenser Company will manufacture and sell condensing apparatus, vacuum pumping machinery and cooling towers, embodying novel and important improvements.

This apparatus has been designed especially to meet the demand for a higher class of work and more economical performance than has heretofore been attained in connection with electric lighting and railway power stations, steel mills and blast furnaces.

The company will build both surface and jet condensers of all sizes, and having air and circulating pumps either steam, power or electrically driven. The application of the central condensing system to large and extended plants will receive special consideration. A modification of this system, which they have developed, is especially effective in producing the high vacuum required with steam turbines. For marine service a new system of surface condensation, which allows a reduction in both weight and cost of operation, is offered.

Norwalk Iron & Steel Plant.—Negotiations have been resumed for the erection of the rolling mill at Norwalk, Ohio, to be known as the Norwalk Iron & Steel Company. The plans call for a main building, 120 x 600 feet, to be equipped with a 16-inch roll train, heating furnaces, &c. J. E. Carnahan, president of the Carnahan Tin Plate & Sheet Company of Canton, Ohio; Edward E. Erickson and F. Prottsman of Pittsburgh, at a conference with James G. Gibbs and A. M. Beattie of Norwalk, agreed to build the plant if the people will purchase the 500 lots sold nearly a year ago. This most of the old purchasers have agreed to do, and as soon as the remaining lots are sold the plant will be erected. Mr. Carnahan advises us that the prospects for the sale of the lots and building of the mill are very promising.

The Supreme Court of the United States on Monday rendered an important decision in regard to the right of the Government to collect customs duty on goods brought into the United States from the Philippines. The Court held that the duty was illegal, the Philippines having become American territory upon the signing of the Treaty of Paris. Four justices dissented from the opinion of the majority.

J. R. Drexel, the Philadelphia banker, has placed an order with George L. Watson, the Glasgow yacht builder, for what will be the largest pleasure yacht afloat. She will be over 300 feet in length on the water line and will have 40 feet beam, with a tonnage of 2500.

The Brass Fittings Manufacturers' Association, which has been in session in Pittsburgh for a few days, has adjourned to meet in Washington, D. C. About 40 concerns were represented, among them being Bailey-Farrell Mfg. Company and Standard Sanitary Mfg. Company, both of Pittsburgh. Officers were elected as follows: A. D. Sanders, Chicago, president; C. K. Sanborn, New York, vice-president; W. T. Doyle, Pittsburgh, secretary, and J. B. Calvilledge, treasurer.

Iron and Industrial Stocks.

The market for iron stocks has been rather quiet during the week, the industrial stocks generally being under the shadow of the erratic performances of Amalgamated Copper speculation, which has to some extent forced liquidation in other shares to protect the copper holdings. Until Tuesday nearly all the issues showed declines.

The Chateaugay Ore & Iron Company have made a proposition to the holders of the first mortgage bonds and of the consolidated bonds for a reorganization of the property without receivership in conjunction with the Delaware & Hudson Company. The plan provides for an issue of \$750,000 first preferred stock, a reduction of the present common stock to \$750,000 of second preferred stock and the authorization of new common stock to the amount of \$1,250,000. A new mortgage for \$1,500,000 is proposed, bearing 4 per cent. interest, to be guaranteed by the Delaware & Hudson Company in return for the new common stock which is issued to that company. Bondholders are offered 40 per cent. in cash of the outstanding bonds or can exchange the old bonds for 35 per cent. of their face value in the new issue and 65 per cent. in new first preferred stock. The plan also provides for the retirement of a \$200,000 mortgage on the railroad and \$464,800 in new capital.

The capital stock of the Pittsburgh Plate Glass Company was increased last week from \$10,500,000 to \$12,500,000. The increased capital is to be used to extend the stock house system of the company in different parts of the country. The stockholders of the company will be permitted to subscribe to the \$12,500,000 new stock at par and will be given warrants to the extent of 25 per cent. of their holdings. The present stockholders will pay 12½ per cent. on their present warrant allotment on January 2, and 12½ on April 1.

Moran Bros. Company, shipbuilders of Seattle, Wash., are offering for sale, through N. W. Halsey of New York, \$500,000 of first mortgage gold bonds.

Dividends.—The Philadelphia Company of Pittsburgh have declared a regular dividend of 1½ per cent. on the common stock, payable January 15.

American Steel Casting Company have declared semi-annual dividend of 3½ per cent. on the preferred stock, payable December 20.

The Otis Elevator Company have declared the usual quarterly dividend of 1½ per cent. on their preferred stock, payable January 15. Books close December 24 and reopen January 16.

The Empire Steel & Iron Company have declared the regular semiannual dividend of 1½ per cent. on their preferred stock, payable January 1. Books close December 21 and reopen January 2.

The United States Projectile Company have declared the regular quarterly dividend of 2 per cent. and an extra dividend of 2 per cent., payable January 1. Books close December 26 and reopen January 2.

The National Stamping & Enameling Company have declared a dividend of 4 per cent. on the common stock, payable quarterly in 1902. The regular quarterly dividend on the preferred has also been declared.

The Sloss-Sheffield Iron & Steel Company make the following report for the quarter ending November 30, 1901:

Profit from operation.....	\$240,741
Deduct for depreciation.....	40,778
Balance.....	\$200,063
Interest and taxes.....	57,468
Surplus.....	\$142,593
Surplus brought forward from September 1.....	455,306
Total surplus.....	\$597,900
Preferred dividend (quarterly).....	114,000
Surplus.....	\$483,900

James Russell, Commissioner of Mineral Statistics of Michigan, has just issued his annual report. It deals, of course, in detail with the iron and copper mines. There is a chapter also on the charcoal furnaces of the State, on the coal mines and on the salt works.

Trade Publications.

Lathes.—The Bradford Machine Tool Company of Cincinnati have issued a very handsome catalogue dealing with their engine lathes. In designing these lathes it has been the aim to build a tool of great accuracy, strength, convenience in handling and one that will fully meet the requirements of modern machine shop practice. All the spindles are of crucible steel, with journals ground to the greatest degree of accuracy, the hole in the spindle being bored through the solid. The spindle bearings are of gun metal, of the taper pattern, fitted with collars for quick and accurate adjustment in taking up wear. The carriage has solid bearings on V's its entire length. Provision is made for taking up wear by the liberal use of gibs. The power cross feed is graduated to read in thousandths. Lathes of 18-inch swing and upward have T-slots in the carriage for clamping down the work. The tool post is furnished with a concave ring and convex wedge with which to elevate the tool, or with threaded collar, as may be desired. A plain rest, instead of a compound rest, is furnished on small sized lathes when so ordered. The lead screw is accurately and smoothly cut and not splined. As the feed rod is almost universally used for feeding, greater accuracy may be expected when using the screw for thread cutting. Either right or left hand threads may be cut. The lead screw nut is of high grade phosphor bronze, split, and operated by a cam. The feeds cover a wide range. An automatic stop is placed on all lathes. The gears are cut from the solid and all small gears are cut from bar steel. Sufficient change gears are furnished with each tool for the cutting off all standard threads. The gear guards, which are attached by hinges, may be easily thrown back when oiling, and are placed on all lathes for the protection of workmen from exposed gearing. The tail stocks are made either straight or overhanging.

Time Recorders.—Is the subject of a neat pamphlet by the International Time Recording Company of 277 Broadway, New York. This company make card, key, autograph, dial and pointer time recorders, and also the standard time stamp. Their recorder card system furnishes one of the best methods of keeping account of the time of employees. The record is made on a card outside of the clock, and each employee makes his record for a full week on a card by itself.

Water and Gas Works Appliances and Pumping Machinery.—A very elaborate catalogue by R. D. Wood & Co., Philadelphia, describing their water, gas works and pumping machinery has been received. In this the company have aimed in a general way to outline their systems of water supply and lines of illuminating gas with the appliances more especially made by them and used in connection therewith. While in no sense a treatise, it is intended to answer some of the questions often asked by persons contemplating the building of water or gas works. Under the head of electrolysis it is stated that nothing is more menacing than this action to the life of a cast iron pipe system where return electric currents are allowed to pass through them. With present experience it is difficult to say just what effect a return of a given number of volts and amperes will have on a line of pipe. It is impossible for the engineer to know even approximately without great expense the condition of his mains where electrolytic action has taken place. Thus the gas or water supply of large sections of cities is often endangered by the failure of mains without previous warning. In one case a 48-inch water main failed, owing to the effect of electrolysis, leaving a large portion of one of our Eastern cities without water supply. Many engravings are presented which show the action upon pipes of these escaping currents of electricity.

Electric Motors.—We have received a very elegant catalogue from the Northern Electrical Mfg. Company of Madison, Wis., dealing with the electric motors and generators built by them, and their application to the driving of machinery of all kinds. The great saving in the

cost of power with the use of electric motors is due to the elimination of the enormous losses inherent in any system of shaft or belt transmission. Exhaustive tests of plants in various lines of manufacture have been made showing the amount of power developed at the initial unit, the amount of power required by each machine and the amount of power that could be saved by the best methods of electrical transmission. An important factor in regard to the use of direct connected electrical motors for machine driving is the small amount of floor space required for a given number of machines. This is at least one-third less than would be required to successfully operate them by line shaft transmission. In a motor driven factory each driven machine or group of machines may be located at the will of the manufacturer to suit his convenience, according to the most economical arrangement of floor space and of the handling of the material to be manufactured. He need not consider the strength of the overhead portions of his building beyond that which is necessary to properly support the roof. Very elegant engravings are presented showing electrically driven shops and motors direct connected to almost every known machine tool. Complete descriptions are given, showing the construction of the generators and motors built by this company, which are noted for their high efficiency, reliability of action and perfection of design and construction.

The December issue of *Graphite*, published by the Joseph Dixon Crucible Company, Jersey City, N. J., contains much interesting information relative to the uses to which graphite is put, and gives a complete list of the numerous productions of the company.

A New Consolidation.—PITTSBURGH, Pa., December 11, 1901.—(By Telegraph.)—The Pittsburgh Steel Hoop Company, with works at Glassport, Pa., who roll hoops and cotton ties, have been taken over by the Pittsburgh Steel Company, who are building a large plant at Monessen, Pa., to make wire rods, wire and wire nails. The capital stock of this concern is \$3,000,000, and for each share of Pittsburgh Steel Hoop Company's stock three shares of Pittsburgh Steel Company were given. Wallace H. Rowe, formerly Pittsburgh manager for the American Steel & Wire Company, is president of the Pittsburgh Steel Company, Edwin Bindley is vice-president, W. C. Reitz is treasurer and C. E. Beeson secretary.

The National Tube Company will not build a new blast furnace at McKeesport, as reported. This concern are building a new blast furnace at Wheeling, which will make 600 tons a day, and will be ready for blast in the spring or early summer.

The Bessemer Coke Company of Pittsburgh will build 200 more coke ovens at the Griffin works, in the Klondike region. These will give the Bessemer Coke Company about 1000 ovens and will make this concern one of the largest independent coke companies in the Connellsville region.

The Tacony Iron & Metal Company, Tacony, Philadelphia, Pa., who went into voluntary bankruptcy last spring, were sold by the receiver, Alfred Geiser, on the 4th inst. Chas. Porter, former president of the company, bought the property, subject to the referee's decision. The bid was for \$12,200 over the total liabilities of the company, \$49,764.54, which sum includes two mortgages for \$30,000 and \$15,000, respectively.

The report that the Carnegie Steel Company had broken ground at Duquesne for the erection of a 14-inch billet mill, to have a capacity of 12,000 tons a month, is untrue, as no such mill is being built, nor do the company contemplate building such a plant. A mill for making small billets, which has been under construction for several months at Duquesne, is about completed.

The Duquesne Malleable Iron Company have been organized in Pittsburgh with a capital of \$175,000, and have applied for a charter. The new concern will build a plant in the Pittsburgh district for the manufacture of malleable iron castings.

HARDWARE.

GUARANTEEING PRICES.

This is a season when in the ordinary course of things many goods are sold under a guarantee as to prices in one form or another. A reminder to the manufacturers and the jobbers as well of the manifold mischief of the practice is therefore timely. There is indeed little to be said in favor of the guarantee when the interests of the manufacturers and the trade as a whole are considered, and as it often operates it fails to be advantageous even to the buyer for whose benefit it has been granted. The inequity of the practice and the disturbance which it causes to the trade are thus forcibly stated by a prominent manufacturer:

A guarantee is a most excellent thing for a buyer who wants to settle for the goods regardless of the seller's wishes. This would be particularly true if he were the only one who had a guarantee. But as a rule guarantees are a most pernicious thing—bad for both buyer and seller; they encourage unfair dealings and unpleasant relations between the manufacturer and his customer. It is unbusinesslike on the part of the manufacturer, because he will not know what price he is going to get for his goods until payment day comes, and then some competitor makes the price. The market is demoralized, not simply to the manufacturer, but to the jobber as well. The large jobber has no advantage over the man who buys just enough to be recognized as a jobber by the manufacturer; in fact, the small jobber may be unprincipled, or, if fair, he may be very shrewd, and give the matter his particular personal attention, and under a guarantee get a price that the jobber buying several carloads could not get. Should guarantees become general, they might in time become equally general with the jobber selling the retailer, and as the jobber has from 10 to 50 or more accounts on his ledger than the manufacturer, it is easy to see who would be the sufferer.

Some progressive and broad minded jobbers have frankly acknowledged the evils of the guarantee system, and there is ground for hoping that it may under the prevalence of better principles and methods in commercial life be abandoned as unbusinesslike. A firm stand by representative jobbers in opposition to it would be a marked advance and would have much influence in helping to do away with the pernicious practice.

EDITORIAL NOTES.

One of the noticeable results of the changed conditions which have characterized the market for the past year or two has been the almost complete elimination of the broker. The consolidation of manufacturing interests has had much to do with this. In former periods the broker frequently drove a thriving business by playing off one manufacturer against another, but of late, owing in part to the influence referred to and in part to the activity of business which has enabled manufacturers to market their goods without his aid, there has been comparatively little opportunity for his operations. The time, however, is apparently not far off when in almost every line competition will be as active as ever, and if there should also be a lessening of the demand, so that orders are eagerly sought after, there is little doubt that any means by which the merchants and manufacturers are brought closer together will be again in favor.

The great project of consolidating the jobbing interests, while not attracting much public attention, has not been abandoned, and efforts, it is understood, are being

made to carry out the plan in some form. Its projectors are, however, keeping their own counsel and refusing to gratify the curiosity of the trade as to the lines on which they are working and the success which is attending their efforts. The extent to which the jobbing business is at present overdone is a consideration which enforces the opportunity and need of something like consolidation. This, on a small scale, has often occurred in the past, though in most cases it has been simply a graceful method in which houses have seen fit to go out of business. There certainly appears to be no reason why there should not be a uniting of several houses into one strong concern. To what extent this would be for the purpose of securing the advantage of individual retirement from trade is a question. The trade, however, refuse to recognize the feasibility of consolidating jobbing interests in general, and regard any suggestion that such a thing is contemplated as a reflection on the sagacity and good sense of those who are keeping the trade guessing about the precise character and scope of the mysterious consolidation for which they are working.

The value to a manufacturer of a reputation for the quality of his product finds many illustrations in the trade. It tends greatly to diminish the expense of marketing goods and serves as a safeguard against fluctuations in demand and price, which carry with them so many attendant uncertainties. A striking example of this is found in the case of a certain manufacturer of one item of Hardware, who has no agents or salesmen, who never solicits business, and who asks nearly twice as much for his goods as any manufacturer of a similar appearing article. With this condition of things, and in spite of his lack of live, up to date business methods, his factory runs full all the time, thus illustrating the inherent strength of a good article, well made, well introduced and whose quality has never been allowed to deteriorate. To acquire such a position for their products is an ambition justifying painstaking and persistent efforts on the part of manufacturers.

Condition of Trade.

There is a falling off in the volume of business, as usual at this time. Current shipments are for the most part of holiday and winter goods, which are hurried along to meet the immediate requirements of merchants. In these lines trade is active and indicates in its volume and the character of the goods moving an enterprising and prosperous condition among the trade at large. There is a good deal of business being done by the jobbers throughout the country in supplying the smaller trade, and they are also buying for next year's requirements. The orders which are thus coming in to manufacturers are very satisfactory, showing confidence on the part of merchants in the stability of prices and in the continuance of existing prosperous conditions. Comparatively few manufacturers have full stocks of goods on hand, nearly all of them welcoming something of a relaxing in the demand which will permit them to get in shape for next year. There is a better supply of some lines, especially of heavy goods, such as Pipe, Sheets, Plates, &c. Orders for season goods are being booked rapidly and many anticipate something of a scarcity in some important lines. Prices generally are steady and firm. Steel Goods and Screws are in an unsatisfactory condition and low prices are ruling. Scythes seem to have settled to their level. Wire Nails and Wire are regarded with suspicion, and the trade, unless covered by some kind of special understanding with the manu-

facturers, are buying very cautiously. The general situation is regarded as very satisfactory and the outlook for business as excellent. The year draws to a close with conditions that should contribute to the enjoyment of the holiday season.

Chicago.

(By Telegraph.)

December is keeping up the reputation of the year for heavy trade. While the volume of business is not so large as that of November, it is much in excess of former years. The open weather is responsible to some extent for the heavy trade in certain lines, notably in Wire Nails and Fencing. The generally prosperous condition of the people, however, is responsible for the heavy business doing in miscellaneous classes of Hardware. The building trade has seldom been more active than this fall and winter, and the prospects are promising for its indefinite continuance. The approaching holiday season is also bringing with it a heavy demand for all kinds of fancy goods, such as are in favor with the people at this time. The scarcity in Sheets has not yet been wholly relieved. Receipts from the mills are almost instantly distributed among clamoring consumers. Wood's Smooth Sheets are particularly scarce and in strong demand. Scarcity is already apprehended in Wire Cloth, Screen Doors and Window Screens for the coming season. Some of the leading manufacturers of Wire Cloth have recently informed the trade here that their output was so completely covered by contracts booked that they would take on no new customers. The trade, therefore, is not in a condition to hear without much uneasiness the unwelcome news that on Monday the Wabash Screen Door Company's main factory at Rhinelander, Wis., was burned. This factory had an enormous stock of Wire Cloth on hand, as well as a large stock of Screen Doors and Window Screens made up for the approaching season. This factory is the largest of the kind in the West, and its destruction coming at this time is a serious matter. Many jobbers had contracts with the company which it will be difficult to place elsewhere. It seems under the circumstances that those who can do so should as quickly as possible arrange to cover their requirements of Wire Cloth and Screen Doors and Window Screens. The Heavy Hardware jobbers likewise report a trade of more than usual volume for the season, and continued scarcity in such articles as Bolts, Horseshoes and Chain. The Carriage manufacturers are now placing contracts for their supplies, and thus add considerably to the volume of current trade.

St. Louis.

(By Telegraph.)

The general condition of demand in the Hardware market is reported to be about the same as when we made our last report. A very heavy call is to be noted for Axes and Cross Cut Saws. While the irregularity in prices continues to an extent in Steel goods, yet considerable of an improvement in the stability of prices is said to be showing itself. Shovel prices are still rather mixed, but it is hoped that as a result of the meeting of the association which is soon to be held, action will be taken to correct existing unsettled conditions. The demand for Meat Cutters has been gradually expanding for the past two years, and trade in this line is now a very substantial item in the jobbers' list. Large and small sizes of this class of goods share alike in the sales. Jobbers say that where two years ago they carried one make of these goods they now handle three or four different lines, and find ready buyers for all. The heavy department of the market is in a very healthy and satisfactory condition, and it is said that the demand for this season of the year is above the ordinary.

NOTES ON PRICES.

Wire Nails.—The week has brought no particularly new developments in the Wire Nail market, but there has been no improvement in the matter of prices. Quotations have reached a point at which Nails are relatively low compared with the prices ruling for Billets, and manufacturers who have to purchase their raw material are at a serious disadvantage. There is a consider-

able irregularity in quotations, which depend to a considerable extent upon the conditions in each transaction. The tone of the market is far from strong and lower prices are developing and becoming more open, especially with the concerns which have recently been entering the market. A common quotation for ordinary lots is \$2.10, f.o.b. mill, but this price is shaded freely on attractive business. The leading interest are pursuing a conservative policy and permitting some orders at low prices to go to their competitors, while at the same time they are taking care of their regular customers.

New York.—In the local market there is some irregularity in the volume of demand, which fluctuates from day to day. This does not, however, perceptibly affect the aggregate quantity of Wire Nails going into consumption. The market is represented in a general way by the following prices: Small lots from store, \$2.35 to \$2.40; carloads on dock, \$2.25.

Chicago, by Telegraph.—Prices of Wire Nails have not receded during the week, but appear to have touched the bottom, and the belief is growing that no further decline is expected, unless something happens to cause an increase in the supply of steel. The leading manufacturers are selling a very heavy quantity of Nails and so far as volume of business is concerned express satisfaction with the situation. Stocks are light, as the Nails now manufactured are going directly into consumption owing to the open weather, which enables building operations to be actively prosecuted. Jobbers are quoting small lots from stock at \$2.30 to \$2.35, and carloads at \$2.25.

St. Louis, by Telegraph.—The market for Wire Nails still continues its irregular course. The range of prices from \$2.30 to \$2.35 about covers the condition existing.

Pittsburgh.—There is no improvement to report in the Wire Nail market, either as regards demand or prices. The bulk of the business being placed is for small lots, buyers having little confidence in the future of the market. There is a wide range in prices, which depend largely on the nature of the order and the point of delivery. In a general way the Wire Nail market may be quoted at \$2.05 to \$2.10, f.o.b. Pittsburgh, but we have reports that even the lower price has been shaded. Small lots are held at \$2.15 to \$2.25, at mill.

Cut Nails.—The demand for Cut Nails is confined to moderate proportions. From some mills it is still difficult to obtain full assortments, owing to the continued difficulty in obtaining steel. The market is firm at the following quotations, f.o.b. Pittsburgh, plus the actual freight to point of destination, terms 60 days, or 2 per cent. off in 10 days:

Carload lots.....	\$2.05
Less than carload lots.....	2.10

New York.—About the usual amount of business is being done in the local market in Cut Nails. Representatives of mills are adhering to the price of \$2.25 for Nails from store. Jobbers are asking the same price generally, but in some instances are selling 2 cents below these figures. New York quotations for carload and less than carload lots are as follows:

Carload lots on dock.....	\$2.18
Less than carload lots on dock.....	2.23
From store.....	2.25

Chicago, by Telegraph.—The demand for Cut Nails is checked to some extent by the reduction in price of Wire Nails and small lots from stock are firmly held at \$2.35.

St. Louis, by Telegraph.—The market conditions and prices for Cut Nails remain the same. Small lots from store are quoted from \$2.30 to \$2.35.

Pittsburgh.—There is only a fair demand for Cut Nails, many former users of these having gone back to Wire Nails, because the price of the latter is slightly less than that of Cut Nails. The market on Cut Nails is fairly firm. In some cases jobbers are making slight concessions. We quote for domestic trade, f.o.b. Pittsburgh, plus Tube freight to point of destination, terms 60 days, or 2 per cent. off in 10 days:

Carload lots.....	\$2.05
Less than carload lots.....	2.10

Barb Wire.—A limited demand, coupled with a desire on the part of manufacturers for Barb Wire orders, has resulted in prices being shaded. Regular quotations are to some extent becoming nominal, concessions of from 5 to 10 cents being obtainable on attractive orders. Quotations are as follows, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days:

To jobbers in carload lots, Painted.....	\$2.60
To jobbers in carload lots, Galvanized.....	2.90
To jobbers in less than carload lots, Painted.....	2.65
To jobbers in less than carload lots, Galvanized....	2.95
To retailers in carload lots, Painted.....	2.70
To retailers in carload lots, Galvanized.....	3.00
To retailers in less than carload lots, Painted.....	2.80
To retailers in less than carload lots, Galvanized...	3.10

Chicago, by Telegraph.—The open weather is protracting the demand for Fencing much beyond the usual period. Manufacturers report a very heavy tonnage of orders now being booked, while jobbers are likewise experiencing an active movement from store. Small lots are quoted at \$2.70 to \$2.80 for Painted and \$3 to \$3.10 for Galvanized.

St. Louis, by Telegraph.—A good demand for the season is reported in the market for Barb Wire and prices are without change from our last quotations. Jobbers quote carload lots of Painted at \$2.75 and Galvanized at \$3.05; less than carload lots at \$2.80 for Painted and \$3.10 for Galvanized.

Pittsburgh.—Only a small amount of business for Barb Wire is being placed, as is usual at this season of the year. Prices are being shaded, but regular quotations are as follows: Galvanized Barb Wire, \$2.90 in carload lots to jobbers, and Painted, \$2.60. Terms 60 days net, 2 per cent. discount for cash in 10 days, f.o.b. Pittsburgh.

Plain Wire.—Former conditions rule in the Plain Wire market. Prices are shaded and the larger part of the orders come from manufacturers of Wire products. Regular quotations are as follows, f.o.b. Pittsburgh, terms 60 days, or 2 per cent. off for cash in 10 days:

Base sizes.	Plain.	Galv.
To jobbers in carload lots.....	\$2.25	\$2.65
To jobbers in less than carload lots.....	2.30	2.70
To retailers in carload lots.....	2.35	2.75
To retailers in less than carload lots.....	2.45	2.85

The above prices are for the base numbers, 6 to 9. The other numbers of Plain and Galvanized Wire take the usual advances, as follows:

6 to 9.....	Base.....	\$0.40 extra.
10.....	\$0.05 advance over base.....	.40 "
11.....	.10 " " " " " " " " " " " "	.40 "
12 and 12½..	.15 " " " " " " " " " " " "	.40 "
13.....	.25 " " " " " " " " " " " "	.40 "
14.....	.35 " " " " " " " " " " " "	.40 "
15.....	.45 " " " " " " " " " " " "	.75 "
16.....	.55 " " " " " " " " " " " "	.75 "
17.....	.70 " " " " " " " " " " " "	1.00 "
18.....	.85 " " " " " " " " " " " "	1.00 "

For even weight bundles, 50 pounds and over, 5 cents per bundle advance on above.

Chicago, by Telegraph.—Manufacturers report a large business in Plain Wire, but are now in a position to make prompt shipments. The leading manufacturers have greatly increased their Wire drawing capacity and it has relieved the situation. Jobbers quote small lots of Plain Wire from stock at \$2.25 to \$2.30 base.

St. Louis, by Telegraph.—Plain Wire is in fair demand and jobbers quote No. 9 at \$2.40 to \$2.45, and Galvanized from \$2.80 to \$2.85, with the usual advance for other sizes.

Pittsburgh.—As noted before, manufacturers of Wire products are buying heavily for next season's trade. There is a good deal of unevenness in prices, and in some cases heavy cuts are made. Regular quotations are as follows:

To jobbers in carload lots.....	\$2.25
To jobbers in less than carload lots.....	2.30
To retailers in carload lots.....	2.35
To retailers in less than carload lots.....	2.45

Galvanized Wire up to No. 14 is 40 cents advance on Plain; Nos. 15 and 16, 75 cents advance, and Nos. 17 and 18, \$1 advance. Terms are 60 days net, with 2 per cent. off for cash in 10 days, f.o.b. Pittsburgh. However, the above prices are materially shaded on good orders.

Screws.—The market on Screws is in a somewhat unsatisfactory condition, and prices are irregular. Both 87½ per cent. and 90 per cent. are used as base discounts by the manufacturers, but extras are given freely according to the quantity, desirability of order, standing of the customer, &c. There does not appear to be any immediate prospect of an agreement among the manufacturers which will have the effect of advancing prices or of controlling the market.

Shovels and Spades.—The manufacturers of Shovels and Spades are now holding a meeting of more than usual importance. At this time there are a number of questions before them calling for decision, to which careful and prolonged deliberation is given. Prominent among these is the question as to the policy to be adopted in regard to outside competition. As we go to press the manufacturers are still in session.

McKinney Mfg. Company.—McKinney Mfg. Company, Allegheny, Pa., under date of November 27, have issued the following discounts, which represent the advance in the price of Wrought Butts and Strap and T Hinges to which reference was made in our last issue. The discounts on the Butts apply to list of April 1, 1895, and on Hinges to that of March 15, 1901. Additional discounts of 25 per cent. on the Butts and 20 per cent. on the Hinges are frequently given:

Bright Steel Butts.

	Discount.
Class Nos. 700, 703, 704, 705, 707, 709, 711.....	.60 %
Class Nos. 713, 714.....	.75 %
Class Nos. 715, 717, 719, 721, 723, 724, 725....	.60 and 10 %

Strap and T Hinges.

Light Strap.....	.70 %
Heavy Strap.....	.75 and 10 %
Light T.....	.66 ⅔ %
Heavy T.....	.60 and 5 %
Extra Heavy T.....	.75 %
Long Chest.....	.55 %
Hinge Hasps.....	.55 %
Crate Hinges.....	.70 %
Crate Hasps.....	.55 %

Cordage.—Business in Rope is moderate, which condition has characterized the market for the past two or three weeks. Quotations vary with different manufacturers, as follows, on a basis of 7-16 inch and larger: Sisal Rope, 8½ to 9¼ cents; Manila Rope, 12¼ to 13 cents, with 1¼ cent rebate per pound in large quantities allowed on both kinds of Rope.

Glass.—Trade is quiet and lower prices are not unlooked for after the first of the year. Reports indicate that Window Glass manufacturers outside the combine show little disposition to come to an agreement to maintain prices. Glass factories are generally affected unfavorably by the scarcity of skilled workmen, who are induced by promises of higher wages to go from one factory to another. This leaves vacant places in many factories and reduces the output of Glass. The jobbers' association quotations, on both double and single strength, over the entire country, are as follows:

	Discount.
Less than car lots from store.....	.90 %
Carloads from store.....	.90 and 7½ %
Carloads, f.o.b. factory.....	.90 and 12½ %

It is understood that Glass jobbers outside the association have made quotations on less than car lots of Glass from store of 90 and 5 per cent. discount, also that the association price on carloads f.o.b. factory, has been shaded.

Oils.—*Linseed Oil.*—The local Linseed Oil market is somewhat unsettled by resales of low priced Oil, which is being offered to the trade at about 50 cents per gallon for Raw. This Oil was contracted for some time ago at low figures. The advance of Flax Seed in the West has had a stiffening effect upon the market generally. It is estimated that about 75 per cent. of the Flax Seed crop has been purchased by crushers at prices which will bring the average cost of Oil to 50 cents per gallon. Spot business is light, and the uncertainty of the future of the market does not inspire buyers to place contract orders. City Raw Oil is quoted at 56 cents for small lots, and out of town brands at 54 cents.

Spirits Turpentine.—During the early part of the week consumers came into the local market and pur-

chased a quantity of Turpentine. Southern advices are to the effect that there is a good inquiry for export, with light receipts. The market at this point is firm, according to quantity, at the following quotations: Southern, 38 to 38½ cents; machine made barrels, 38½ to 39 cents per gallon.

BRITISH LETTER.

Offices of *The Iron Age*, HASTINGS HOUSE,
NORFOLK ST., STRAND, LONDON, W. C., NOV. 30, 1901.

The Trade of the Week.

THE sense of slackness in trade to which I have two or three times alluded is now being felt in reality in the English Tool trade. Makers of Angles, Vises, Heavy Hammers and similar goods are having a dull time. At this period of the year orders are generally brisk for Tools used by masons, bricklayers and joiners. This year even that trade is dull. Edged Tool makers spend a good deal of time about now making Skates, but stocks have accumulated for several years and present appearances point to another non-skating winter. A good, hard frost would not only mean a sudden demand for Skates, but would stiffen the sales of many other Tools. In the district of Birmingham unemployment is beginning to be felt, there being a larger drain upon the trade unions in respect of out of work pay. When this state of things happens it invariably follows that the working class are much more economical in purchasing goods. The shrinkage of this purchasing capacity naturally affects retailers seriously, and they are undoubtedly feeling the pinch. On the termination of the Metal Trade Alliance the 5 per cent. bonus naturally ceases, but the men threaten that if the terms of the agreement are insisted upon they will make a demand for a minimum wage which would exceed in value the 5 per cent. They threaten to strike unless their terms are conceded. If a strike should follow present trade conditions it would be a serious matter, not only for the home trade, but also for the export trade. There is an enormous demand for army requirements. Although the Military Gun trade is busy, the Sporting Gun and Ammunition branches are unusually dull. Many sportsmen are, of course, in South Africa. The uncertainty of the copper position, with the serious break in prices which has taken place this week, is having a disturbing effect in all the metal trades affected by copper. On the export side the mails this week have brought good orders from New Zealand and from both the West and East Indies. A few good lines have also come to hand from South America. In nearly all our foreign markets there is an excellent demand for Galvanized Iron for roofing purposes, while a steady trade is being done in Edge and Plantation Tools, particularly for the West Indies.

A Newcomer to London.

Another American Hardware agent has settled down in London in the person of William Cruger Cushman, who has taken excellent premises at 19 Chapel street, Milton street, London, E. C. Mr. Cushman has got quite a long list of agencies, the most important of which are Portable Ovens made by the G. S. Blodgett Company of Burlington, Vt.; Pliers, Scissors, &c., made by the Cronk & Carrier Mfg. Company, Elmira, N. Y.; Cutlery specialties made by the Goodell Company of Antrim, N. H., and Refrigerators made by the Ranney Company of Greenville, Mich. William Cushman tells me that he has always been interested in specialties, even in the days when he was one of the partners in the Cushman Brothers Company of Hudson street, New York. He thinks there is an excellent opening for missionary work if it be conducted on sane lines. That is to say, he gets the representation of good salable material, goes out and makes it known among the retailers with a *posse* of travelers, but means as far as he possibly can to confine his actual sales to the big English jobbers. If the English jobbers do not come up to scratch he means to sell direct to the retailer.

More Standardizing.

The report about to be presented to the fifth annual meeting of the Birmingham and Provincial Gun Makers' Association is in many respects a valuable document,

as it takes up the important question of the standardization of minimum dimensions of cartridge chambers of Shot Guns. This work has been continued by the committee which undertook last year the fixing of dimensions of 12, 16 and 20 gauge chambers, and the sizes of the remainder of the Cartridges with which it was intended to deal have since been very carefully considered by the representative Gun and Cartridge manufacturers composing the committee. These sizes have been practically decided on, but have not yet been officially determined. In order to avoid unnecessarily restricting manufacturers, and to simplify and expedite the labors of the committee, it was requisite that the scope of the work should be of a fundamental character only, and it was therefore limited to fixing the minimum dimensions of the chambers, leaving the Gun and Cartridge makers, respectively and individually, to make use of the basis to be thereby provided for their guidance. But it is obvious that as there is at present no restriction as to the maximum chambers and minimum Cartridges, cases might arise in which the difference between a maximum chamber and a minimum Cartridge fired from it would be sufficient to cause accident or inconvenience, and it is therefore desirable that a practical limit should be placed to this difference. The maximum dimensions of chambers could be fixed best by fixing the maximum sizes of Chambering Tools. In limiting this difference the elasticity of the paper, &c. Cartridge tubes and the extra pressure likely to be generated by wads of standard sizes loaded into Cartridges of minimum interior diameter would require to be taken into account.

DEATH OF MALBON KENION SCOTT.

MALBON KENION SCOTT, president of the Scott Hardware Company, Paducah, Ky., died on the 30th ult. Mr. Scott was born near Louisville, August 17, 1832. In his youth he was apprenticed to the tanners' trade. At the age of 20, in New Orleans, he joined the famous Lopez expedition for service in Cuba. Shortly after reaching the island he was made prisoner by the Spaniards and was sentenced to ten years' hard labor. He was carried to Spain in chains, but after arriving at Cadiz his sentence was commuted and he was turned over to the American Consul. At the time of his death he was one of the few survivors of this memorable expedition, which almost brought Spain and this country to war. In 1865 Mr. Scott opened a small tin shop and in 1876 he embarked in the wholesale and retail Hardware and Tin business, with the late L. W. Emery as partner. The firm of Scott, Stevens & Co. were established in 1882, as successors to Scott & Emery. Subsequently the concern became the Scott Hardware Company, the other members of the company being Mr. Scott's three sons. A wife and four daughters also survive him.

MINNESOTA RETAIL HARDWARE DEALERS' ASSOCIATION.

OFFICIAL announcement has been made that the annual meeting of the Minnesota Retail Hardware Dealers' Association will be held in St. Paul on February 26, 27 and 28 next.

WE are advised that a consolidation of business interests on the Pacific Coast is about to be consummated, which will amalgamate in one company the present houses of Miller, Sloss & Scott and the George W. Gibbs Company, San Francisco, Cal., with a capital stock of \$10,000,000. The negotiations now progressing, it is expected, will be concluded before the first of the new year. Miller, Sloss & Scott deal largely in General Hardware, the Gibbs Company handling iron, steel and analogous goods. The intention is to conduct each department separately, but under one general management. The concerns as they are now constituted do business as far east as New Mexico, as far north as Alaska, and they have a growing trade in the Hawaiian Islands and the Philippines. It is proposed to establish branches in Los Angeles and Seattle.

SHOW WINDOW DISPLAY.

The trade are invited to contribute information in regard to methods which have proved satisfactory, with descriptions of attractive displays. Inquiries also are solicited, to which careful attention will be given.

A WATER WHEEL FOR THE WINDOW.

It is well known that moving objects attract more attention to a show window than any other kind of a display that can be made. Many merchants exert special efforts to attract crowds to their windows just before Christmas, and employ mechanical displays only at that season. Where there is no shafting in the

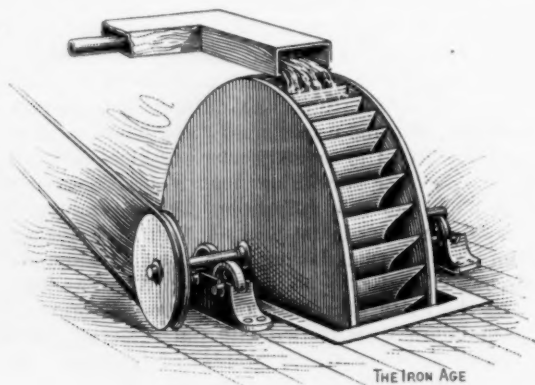


Fig. 1.—The Water Wheel in Position.

building, power for a mechanical display can be supplied by either electric, spring or water motor. Below is given a description of an overshot water wheel that has been used occasionally for the past few years in the show window of J. M. Page & Co., Naugatuck, Conn., and was made by them in their own shop.

This wheel, as it is in position on the elevated platform that is placed in the window, is shown in Fig. 1.

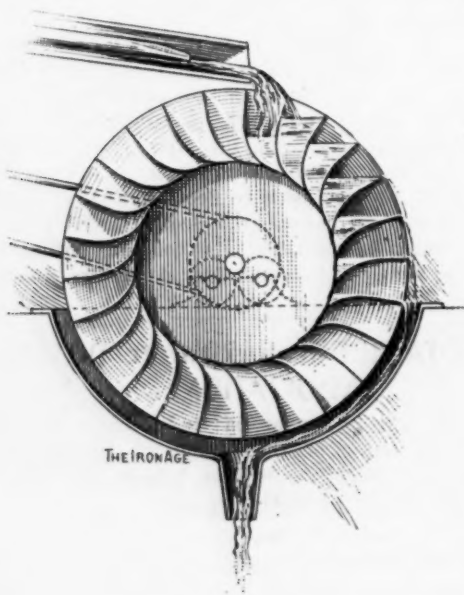


Fig. 2.—Section of the Wheel.

A section of the wheel is illustrated in Fig. 2. The sides of the wheel are made of two pieces of galvanized iron cut into circles 24 inches in diameter. Between these, and perpendicular to them, are placed, and securely soldered, 25 pieces of galvanized iron 5 inches wide and 6 inches long, so that the sides of the wheel will be 5 inches apart. These are arranged to form the buckets and are bent as shown in Fig. 2. It will be noticed that the bottom of each bucket partition is soldered to the bottom of the next one. Arranged in this way the open-

ing of each bucket will be about 3 by 5 inches and the buckets will be about 5½ inches deep. It is essential that they be bent properly so as to hold the water as long as possible and thus secure the maximum efficiency. The construction of the buckets is more clearly shown in Fig. 3. When the galvanized iron wheel is completed, all joints being properly soldered, rigidity is

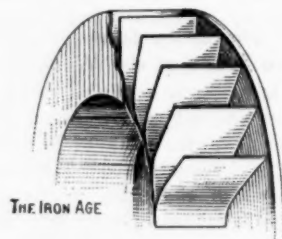


Fig. 3.—Detail of the Buckets.

given to it by fastening to each side a circle of 1-inch boards, 24 inches in diameter, as illustrated in Figs. 1 and 3.

As before stated, when this wheel is used in the window an elevated platform is put in to hold the wheel and the display. In this platform a well is cut, as shown in Fig. 1, and in it is placed the galvanized iron trough illustrated in Fig. 4, to catch all the water from the wheel. The outlet from this trough connects with the sewer pipe. The wheel is supported by a shaft made of gas pipe that works on a grindstone bearing that permits it to revolve readily. On the shaft is fixed a 6-inch grooved pulley, on which a belt runs, working

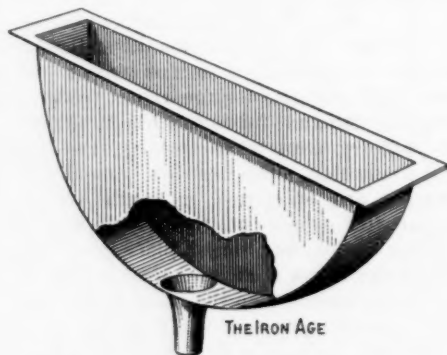


Fig. 4.—The Trough Catching the Water.

the display. The water to run the wheel is supplied through a ¾-inch lead pipe flattened on the end, so as to give a stream about the size of a lead pencil. This wheel has been used in making several displays, in some of which it is in sight and in others hidden. When in sight the pipe is placed in a wooden box or sluice, as shown in Fig. 1. The water fills the buckets and its weight causes the wheel to revolve slowly. The power obtained is sufficient to move fairly large displays slowly. One of the features of this motor is that when it is once in place and started it requires practically no attention, except turning the water off at night and on again in the morning.

A COASTING DISPLAY.

A very attractive display that was operated last Christmas by the water wheel just described by J. M. Page & Co., Naugatuck, Conn., is illustrated in Fig. 1.

Fig. 2 shows how the display is worked. The large wheel is 24 inches in diameter, and has a flange on each side projecting 1½ inches beyond this. The wheel is wide enough to take a 4-inch belt. The small wheel is 6 inches in diameter with flanges projecting 1 inch beyond the pulley surface. These are mounted on bearings that are placed on a platform in the window. Both wheels are covered by wooden hoods. A belt made of 4-inch webbing is run around the wheels, and on them are fastened sleds about 6 inches long, made from cigar boxes and painted attractive colors. On these are placed

dolls dressed in gaudy colors and in life like positions. When the power is applied by a belt to a pulley on the large wheel these sleds move down hill, over the small wheel, under the floor and return over the large pulley ready to slide down again.

To make the scene a winter one, as shown in Fig. 1, empty boxes should be placed on the platform, on which the house and barn in the background may afterward be placed, a board so arranged on edge as to form the line on which the fence can be constructed, and a board

produce the effect of glittering snow. The sleds coasting down the hill and disappearing under the bridge attract a large crowd constantly to the window and form a display that is very appropriate for Christmas time.

CATALOGUE OF RAILWAY SUPPLIES.

A NOTEWORTHY catalogue prepared by Charles B. Holdrege, manager of the railway supply department of Hibbard, Spencer, Bartlett & Co., Chicago, has



Fig. 1.—Coasting Display.

from the top of the hood covering the small wheel for the road. All this should be covered with cotton flannel and stretched so as to represent a country scene, the cloth passing under and close to the webbing on which the sleds are fastened. A little care and attention will make this so that it will represent a hill scene. Put a miniature house and barn, as shown in Fig. 1. Construct a fence on the board fixed for it, and two fences

just been issued. This catalogue comprises 416 pages, and is handsomely and substantially bound in a flexible leather cover. The introductory note states that the firm's large and constantly increasing business among the railways has induced them to publish this catalogue, in which is shown a general line of such material adapted to the railway trade as they are able to furnish. The catalogue contains not only illustrations and

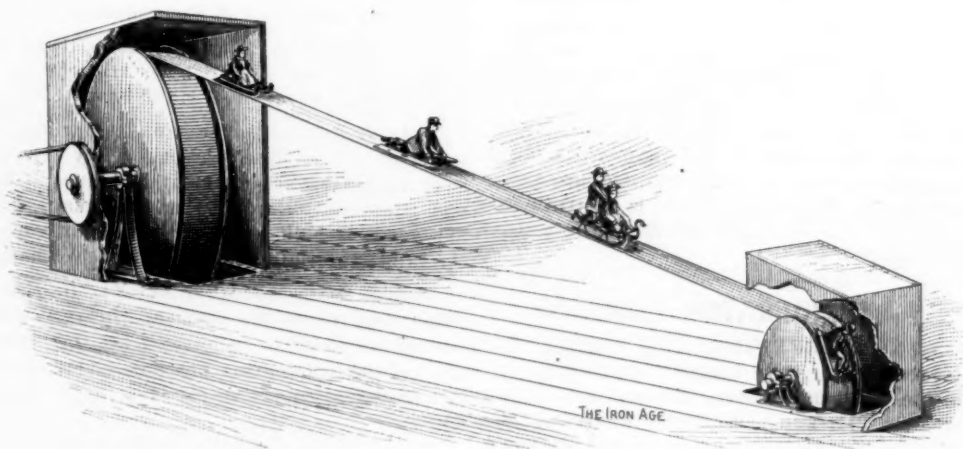


Fig. 2.—Construction of the Slide.

on the hood covering the small wheel. Small trees should be placed in the scene somewhat as shown, and particularly at the top of the hill, where the sleds come out of the hood over the large wheel, so that to those looking at the display it will appear as if the sleds start from behind a clump of trees. It would not look well to have them come up out of a hole in the snow. On the road the sleigh tracks should be marked by black crayon. The background should be made of small trees. Cotton placed on the roof of the house and barn makes them look more realistic, and powdered mica or even common salt scattered on the cotton flannel will

prices of the goods, but also gives standard lists, which are corrected down to date of publication. In looking over this catalogue, whose compilation is the result of years of experience obtained by Mr. Holdrege in this special line of business, the reader is impressed by the great variety of articles coming under the name of railway supplies, and which are of a character to enable them to be carried in the stock of a Hardware house.

J. W. Wolverton, formerly a member of the firm of Wolverton & Bird, Rich Hill, Mo., has opened a new

store in Lawton, Oklahoma, handling Shelf and Heavy Hardware, Stoves, Tinware, Sporting Goods, Plumbing Supplies, &c.

J. STEVENS ARMS & TOOL COMPANY.

NEGOTIATIONS have been completed by which the J. Stevens Arms & Tool Company, Chicopee Falls, Mass., have leased the No. 3 mill of the American Bicycle Company at Chicopee Falls, which has been practically idle for more than a year. The Stevens Company have leased this building instead of erecting an addition to the river plant, as they had proposed to do. The company were compelled to increase the facilities of their plant for their rapidly expanding business. It was deemed best to abandon the construction of an addition to the old wooden structure on the river, provided the No. 3 mill could be secured. It will afford all the space that the company will need for some time, and will involve the employment of from 100 to 150 more men than at present. The building is five stories high, and is 150 x 45 feet. It is supplied with good water power, and also with a steam plant. The Stevens Company will begin the installation of new machinery immediately. The company have men employed exclusively in the manufacture of new machinery, and two machines are turned out nearly every week. The Rifle barrels will continue to be made in the river plant, as before, and the newly acquired building will be used almost wholly for finishing the Rifles. For the delivery of the barrels from the old plant to the new it is probable that a cable carrier will be built across the river, so that the barrels may be transferred with celerity and ease. This will obviate a large amount of cartage between the two plants. The capacity of the company for making Rifles will be almost duplicated by the newly acquired quarters, which will remove the difficulty which the company have had in filling promptly orders for their Rifles.

STAR ENAMELING & STAMPING COMPANY.

THE STAR ENAMELING & STAMPING COMPANY, who went into the hands of receivers in September last, have been reorganized by C. E. Christman and associates, who purchased all the assets, except book accounts, from the Pennsylvania Trust Company, receivers for the former company, and have secured a charter under the laws of New Jersey with a capital stock of \$100,000. A directors' meeting was held at the offices of the company in Allegheny, Pa., November 27, when the following officers were elected: C. E. Christman, president and general manager; J. Roth, vice-president; A. F. Loeb, treasurer; George W. Rowbottom, Jr., secretary. The new company are arranging to largely increase the facilities for the manufacture of their products. The factory was put in operation November 18, and they report that the demand for their goods is so large that they are now running their plant day and night. There is no truth in the report that the new owners contemplate removing the factory to McKeesport.

CHALLENGE REFRIGERATOR COMPANY.

THE CHALLENGE REFRIGERATOR COMPANY, Grand Haven, Mich., have issued two catalogues, one describing the Challenge Iceberg line and the other the Grand line. The first named catalogue comprises 56 pages, contains illustrations showing the rapid growth of the company's plant, gives a full description of the construction of the Refrigerators and presents numerous illustrations of the styles manufactured under this name, the line comprising a great variety of sizes for domestic purposes and larger sizes for the use of grocers, restaurants, &c. The illustrations also show a number of most attractive constructions finished with sideboard features. The catalogue covering the Grand Refrigerators comprises 24 pages, and also shows a complete line of sizes adapted to domestic requirements as well as larger sizes for grocers. This is a cheaper line, but the Refrigerators are nevertheless manufactured with hard wood cases, and care has been taken with the insulating and the system of circulation to secure economical results in the consumption of ice.

PRICE-LISTS, CIRCULARS, &c.

UNION HARDWARE COMPANY, Torrington, Conn., New York office, 95 Chambers street, in charge of Tower & Lyon: Illustrated 52-page pamphlet catalogue of wood goods, showing their regular line of Wood Turnings, including Chisel, File, Screw Driver, Carving Tool and Graver Handles, as well as various other goods of this character, together with Electric Lamp Handles, which are especially new, Base Knobs, Mallets, &c. This company also manufacture a large variety of special goods of every description in both foreign and domestic woods, in either plain, stained, polished, enameled or hard rubber finish. They also produce a large line of Electrical Supplies, such as Battery Boxes, Magneto Bell Boxes, Switch Handles, &c.

GRIFFIN MFG. COMPANY, Erie, Pa.: Price-list of Griffin's Pressed Steel Shelf Brackets, Folding Brackets, Lavatory and Flush Tank Brackets, Drawer Pulls, Door Bolts, &c. An illustration is given of their large new plant.

THE MICHIGAN BARREL COMPANY, Grand Rapids, Mich.: Catalogue of Yukon, Economic and Chilkoot Refrigerators. This catalogue comprises 74 pages, and thoroughly describes the system of insulation and circulation adopted for the different types of Refrigerators manufactured. The eight walls of these Refrigerators are 3 inches in thickness, and consist first of the zinc lining, next of a wood inner casing, then charcoal sheathing, next granite rock wool, then manila paper, next an air space, then more sheathing and finally the outside wooden case. The special points of the fixtures, Hardware and shelves are the subject of detailed illustrations. The Yukon line is the leading line manufactured by the company. They comprise a great variety of sizes for domestic purposes, as well as for restaurants, grocers and others requiring larger space. The Economic line has as its special feature a white enamel provision chamber. This enamel is baked on galvanized iron, and is not paint, but a pure enamel. The special point covered by the use of this finish is the ease with which it can be cleaned. The enamel finish is also applied to some sizes of the Yukon line. The Chilkoot has been brought out to meet the demand for a moderate priced Refrigerator.

CHICAGO FLEXIBLE SHAFT COMPANY, Chicago, Ill.: Catalogue describing their latest line of Chicago Horse Clipping Machines, which they will be pleased to send to any one interested in their product.

E. C. ATKINS & Co., Indianapolis, Ind.: An ingenious folder, in which attention is attractively directed to their Atkins' Silver Steel Hand Saws.

ECLIPSE REFRIGERATOR WORKS, Burlington, Vt.: Catalogue of the Eclipse Cleanable Dry Air Refrigerator, with removable ice chamber and flues. They call special attention to the fact that their plain finished line of ash goods is built in precisely the same manner and of the same material throughout as their ornamental goods.

WILCOX MFG. COMPANY, Aurora, Ill.: Illustrated supplementary catalogue of Door Hangers and Hardware Specialties added to their line since the issuance of their last regular catalogue. The announcement is also made of a complete catalogue for 1902, to be ready early next spring.

WIARD PLOW COMPANY, Batavia, N. Y.: No. 27 catalogue, relating to Plows, Harrows, Sulky Rakes, Automatic Corn Planter, Rolling Colters, Bean Harvester, Adjustable Weeders, &c.

P. J. CONROY, Seventy-fifth street and Island road, Philadelphia: Catalogue covering the Conroy Automatic Refrigerator Door Fasteners, and Locks, Hinges and Refrigerator Trimmings, of which he is manufacturer.

RODERICK LEAN MFG. COMPANY, Mansfield, Ohio: Catalogue showing their line of Spike and Spring Tooth Harrows, Land and Corn Rollers, Hand Carts, &c.

T. J. O'Neil has succeeded Martin O'Neil & Co. in the Hardware, Stove and Farming Implement business in Osage City, Kan.

AUTOMATIC WRINGER COMPANY.

THE AUTOMATIC WRINGER COMPANY are operating a large factory at Muskegon Heights, Mich., in the manufacture of Wringers, Combination Tub and Wringer Benches and Washing Machines. The line of Wringers comprises the Automatic No. 10 and the Success. The Automatic Wringer has an automatic adjustment which equalizes the roll pressure. A chain gear which connects the rolls avoids, it is stated, all side friction, and gives perfect freedom to the movement of the rolls. The machine, it is claimed, cannot be made to run out of gear. This machine is equipped with the new patented revolving clothes spreader, which compels the full use of the rolls, distributes the clothes evenly and feeds the fabric without friction. The rolls used are made of solid rubber, vulcanized on a cold rolled steel shaft. The Success Wringer is also chain geared, and embodies many of the useful and important features of the Automatic machine, but is manufactured to be sold at a lower price. The combination Tub and Wringer Bench is manufactured of hard maple, finished with malleable iron fittings. It is so arranged that the operator is never obliged to wring clothes left handed, the Wringer being entirely separate, so that it can be reversed and always turned at the right hand side. The Washing Machine is named the Surf Washer, and is of the oscillating type. M. P. Janisch is president of the company and F. E. Jones secretary.

HUMPHRYES MFG. COMPANY.

THE HUMPHRYES MFG. COMPANY, Mansfield, Ohio, are now ready to take care of any specification that they may receive for Pumps and Cast Iron Sinks. Since the fire, which occurred on June 7, they have been busily engaged in rebuilding the destroyed portions of their factory, and now believe they have as modern and well equipped a factory as any. Their foundry has been enlarged and rearranged, so that they can carry on the manufacture of their different lines without any confusion and without one line interfering at all with the other. The company refer to the patience and indulgence with which they have been favored by their customers, and hope to repay them by prompt filling of orders in the future.

JAMES H. BAKER MFG. COMPANY.

THE stockholders of the James H. Baker Mfg. Company of Pittsburgh, with works at Tarentum, Pa., have decided to increase their capital stock to \$500,000. The plant will be very much increased and plans have been made for the erection of two buildings, one 80 x 300 feet and one 60 x 200 feet. The James H. Baker Mfg. Company are manufacturers of Wagon Hardware, under the James H. Baker patents, Forgings, Hooks and other products. The business of the concern has grown very rapidly and they find it necessary to enlarge their present facilities to manufacture their goods. The active head of the concern is James H. Baker, whose Wagon Hardware has been known all over the country for many years.

HENRY & WRIGHT MFG. COMPANY.

THE HENRY & WRIGHT MFG. COMPANY, composed of R. G. Henry, formerly superintendent, and D. M. Wright, formerly secretary and treasurer of the American Specialty Mfg. Company, have succeeded the latter concern, and will continue business at 132 Sheldon street, Hartford, Conn., manufacturing Sheet Metal Blanks and Dies and Tools for same, light machinery and novelties under contract. They already manufacture a line of Hardware Specialties, including the Columbia and Twentieth Century Tack Pullers, and are preparing to bring out a line of Pruning Shears consisting of about 12 different styles.

Fred. Mack and Arthur Bishop have formed a partnership in the Hardware, Tinware and furniture business in Erie, Kan., under the style of Bishop Hardware & Furniture Company.

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REQUESTS FOR CATALOGUES, &c.

The trade are given an opportunity in this column to request from manufacturers price-lists, catalogues, quotations, &c., relating to general lines of goods.

Virag Kalman, Budapest, Hungary, advises us that he would value catalogues and price-lists from manufacturers of Hardware novelties, as he is expecting to import such goods from this country.

J. A. McCoppin & Co. is the style of a firm who have lately opened up in business at Hillsboro, Ohio, as dealers in Hardware, Stoves, Iron and Steel, &c. The new house would be pleased to receive catalogues, price-lists, &c., relating to Hardware and allied supplies.

TRADE ITEMS.

In a circular dated 2d inst. Rogers Screw Company, Providence, R. I., announce that they are now prepared to furnish all sizes of Wood Screws in flat and round heads in steel, brass, bronze, and the different finishes required. The company make the point that they are confining their production to Wood Screws only. The following are announced as the representatives of the company in different parts of the country: Warner & Rucker, 88 Chambers street, New York City; Tabb Bros. & Co., 5 West German street, Baltimore; Charles M. Ghiskey's Sons, 508 Commerce street, Philadelphia; Arthur Brittan & Co., 154 Lake street, Chicago; Kemp & McMillan, 40 Dearborn street, Chicago; S. J. Conger, 519 Mission street, San Francisco.

THE extensive plant of the Wabash Screen Door Company, Rhinelander, Wis., was destroyed by fire on the 8th inst., involving a loss estimated at \$100,000.

HIBBARD, SPENCER, BARTLETT & Co., who are now erecting a large warehouse on the north side of the Chicago River, at Chicago, have in view even more extensive improvements. They have purchased the entire block extending along South Water street from Wabash avenue to State street, and lying along the Chicago River in the rear, on which they propose to erect a large store building which will eventually take the place of their present building at Lake street and Wabash avenue. The new property is located about one block northwest of their present store building. The block which has been purchased is now occupied by a number of business structures which are under lease until May 1, so that the beginning of the new building will necessarily be deferred until after that date. The location which has been chosen is advantageous in many respects, the navigation facilities being considered extremely desirable.

AMONG THE HARDWARE TRADE.

Stewart Mercantile Company, Tishomingo, I. T., have lately entered into business, and report a good trade doing. They are dealers in Shelf and Heavy Hardware, Agricultural Implements, Sporting Goods, Wagons and Buggies.

Beever Bros., Hardware merchants, Jellico, Tenn., have opened a branch store at La Follette, which will be conducted under the style of La Follette Hardware Company. The line carried embraces general Hardware, Stoves, Tinware, Sash, Doors, &c.

Messrs. Roth and Watson of the Hardware firm of Baker, Roth & Watson, Packwood, Iowa, have disposed of their interest in the business to Mr. McCabe, and the new firm style is Baker & McCabe, who will continue at the old stand.

Dunn & Winning have bought the Hardware, Stove, Farm Implement, Harness and Vehicle business of Starr & Sutton, Milo, Iowa. They have rearranged the store and made a number of improvements.

Packard Hardware Company, New Bedford, Mass., have opened a branch store at Fairhaven, where they are carrying a stock comprising Shelf Hardware, Tinware, Farming Implements, Wooden Ware, &c.

Foss Hardware & Implement Company have engaged in business at Foss, Oklahoma. Besides general Hardware and Farm Implements, their line includes Harness, Saddlery, Buggies and Wagons. They are just completing a two-story brick store room and a 50-foot corrugated iron ware room.

McConnachie Bros., Walhalla, N. D., have lately moved into a fine new building, which has permitted them to materially enlarge their stock. They report an increased business since taking possession.

Geo. A. Steele has sold his Hardware, Stove and Agricultural Implement business in Frankfort, Mo., to R. S. Shotwell. Mr. Shotwell will move into a new store room, now under construction, about the middle of December. At present he is handling general Hardware, Stoves and Sporting Goods, but in the spring contemplates taking up Farming Implements and Vehicles in addition.

J. B. S. Case has lately embarked in the Hardware line at Anadarko, Oklahoma. Besides Shelf and Heavy Hardware, Mr. Case is handling Stoves and Tinware and Sporting Goods.

The Hardware store of H. W. Crumbaker, Cooksville, Ill., was badly damaged by fire a short time since. The debris has been cleared away and a new and larger building is in process of erection.

Miners' Hardware Company, Joplin, Mo., have incorporated with a capital of \$10,000 to carry on the Wholesale and retail business in Shelf and Heavy Hardware, Stoves, Tinware, Agricultural Implements, Sporting Goods, Miners' Supplies, &c. They have just moved into a large double store, 50 x 100 feet.

J. T. McDonald & Co. are successors to Fields & Evans, Creston, Iowa, dealers in Shelf and Heavy Hardware, Stoves and Tinware, Sporting Goods, &c.

MISCELLANEOUS NOTES.**Riggs-Spencer Company.**

Riggs-Spencer Company, Syracuse, N. Y., are manufacturing a driving mechanism for chainless bicycles. It is referred to as simple and complete, and different from anything heretofore offered in this line. They also manufacture a coaster brake that they use in combination with this mechanism, as well as making it for chain bicycles. It is said to embody a number of new principles in coaster brake construction.

Waterbury Brass Company.

The Waterbury Brass Company, Waterbury, Conn., to meet the demand made by hardware manufacturers, have increased their facilities for producing brass brazing wire, and are now in a position to promptly supply the requirements of this trade. They advise us that a careful study of the use of this material and the knowledge gained through the production of a large variety of solders has led to the manufacture of an excellent wire. They would be pleased to furnish samples of this material as well as of the several grades of spelter solder manufactured by them upon request.

Wrought Steel Registers.

The Hart & Cooley Company, New Britain, Conn., are manufacturing an attractive line of wrought steel registers, with solid wrought brass face plate and fitted with brass operating slide, and are about issuing a catalogue describing them. These registers are made from wrought metal only, no cast metal being used for any part. They are referred to as light in weight, with a consequent saving in freight, a uniform thickness of 1 1/4 inches over all for all sizes affording a great saving in stock room. The operating slide is of extra heavy weight and strength to insure against breakage, and its construction is such, it is pointed out, as to insure a

free and positive operation after years of use. The company state that their face plates will fit cast iron borders of standard make; that holes in border frames for tin box loops are located same as in standard makes of cast iron; and that the net air openings of their registers will average the same as standard designs in cast iron. One design only is manufactured, the list of finishes being very complete. The company are at present making a line of sizes to cover all ordinary requirements, and will add other sizes as rapidly as possible. Their japanned registers are wrapped in paper. All other finishes are packed each register in a separate strawboard box, making a neat and durable package, protecting and preserving the finish. They make no charge for packing or cartage on shipments from factory, and assume all responsibility for breakage in transit up to point of delivery.

Barwest Coaster Brake.

The Barwest Coaster Brake Company, 83 Chambers street, New York, have recently put on the market the Barwest coaster brake, here shown. Fig. 1 represents it in condition for installation in connection with any chain bicycle. It can be regularly furnished for either

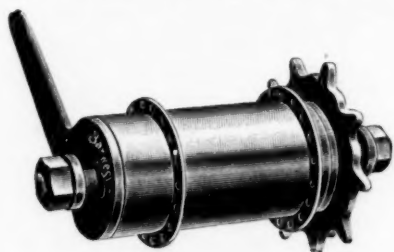


Fig. 1.—Barwest Coaster Brake Complete.

1½ or 1¾ inch chain line, with 7, 8, 9, 10 and 12 tooth sprockets, 3-16 or ¼-inch, and ½-inch pitch, in 16, 18 and 20 teeth. This brake has been tested severely for one year, we are informed, and its reliability is guaranteed by the company. Outwardly it resembles an ordinary barrel hub 1¾ inches in diameter. The braking ring, of phosphor bronze, which expands by the action of a wedge against the inside of the hub between the flanges, has such an expanding force that slight power exerted



Hartzell Skinning Knives.

on the pedal brings the machine under control. The brake, however, will release immediately when the pressure is taken off, and, it is asserted, will not stick or

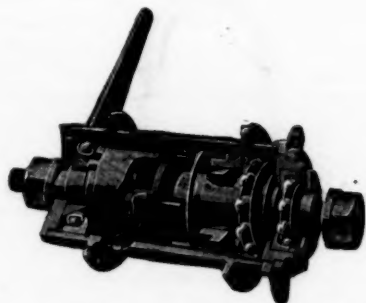


Fig. 2.—Coaster Brake with Portions of Shell and Interior Parts Cut Away.

throw the rider. The expansion of the braking ring being applied between the flanges the strain of braking will not pull the wheel out of true, as is likely to occur

when the brake tension is applied on one side only. From the fact that the brake is applied radially instead of laterally the sprocket is kept in perfect alignment. The entire hub can be substituted for the regular hub, and it can be put in any bicycle by anybody conversant with such work. The wheel is absolutely free and the bicycle will move either backward or forward without applying the brake. It coasts on separate ball bearings placed at each end of the hub, and, it is claimed, is so free in its action that the valve stem will balance the wheel. When pedaling ahead the clutch action is so constructed that it is positively locked immediately pressure is put upon the pedal, there being no springs or



Fig. 3.—Barwest Coaster Brake Disassembled.

other retarding movements to overcome. Any sprocket from 6 to 12 tooth is applicable to this device. There is only one adjusting cone, which regulates the three sets of bearings. From the fact that no fiber is used for frictional purposes the interior mechanism of the brake can be freely filled with oil, which increases the life and wearing qualities of the coaster brake. This brake, as shown in Fig. 1 complete, is listed at \$5. It can also be furnished set up in the rear wheel complete without tire at \$6 list.

Hartzell Skinning Knives.

Emmert Hartzell Cutlery Company, Gettysburg, Pa., are offering a line of skinning knives, as shown in the accompanying cut. A feature of these knives is a broader blade than ordinary all the way through and particularly near the point. This feature is referred to as permitting a longer cut to be given with the same

stroke over knives with narrower blades. The handles are of a square pattern, finished at the end. The blades are referred to as hand made, being hammered from bars of the best grade of imported cast steel, and as being hardened and tempered with as much care as is used in the tempering of the best razors. The manufacturers state that this process of manufacture enables them to guarantee every blade to be perfectly satisfactory. The knives are made with blades from 5 to 16 inches by ½ inches. The company also make many other styles of butcher and kitchen knives, as well as paring, putty and bread knives and spatulas.

Goulds Power Spraying Outfit.

The Goulds Mfg. Company, Seneca Falls, N. Y., are putting on the market the power spraying outfit shown in Fig. 1. It consists of a 1½ horse-power portable gasoline engine, complete with both tube and electric igniter, including batteries, cooling tank, &c. Also a bronze fitted triplex pump with by-pass and water relief valve.

200 pounds pressure gauge, brass discharge shut off and four hose couplings. The necessary connection between the engine and the pump is furnished by the makers.

wrench. It will be seen that the attachment consists of two jaws, having serrated edges, which are fastened to the bar of the wrench by thumb screws. The de-

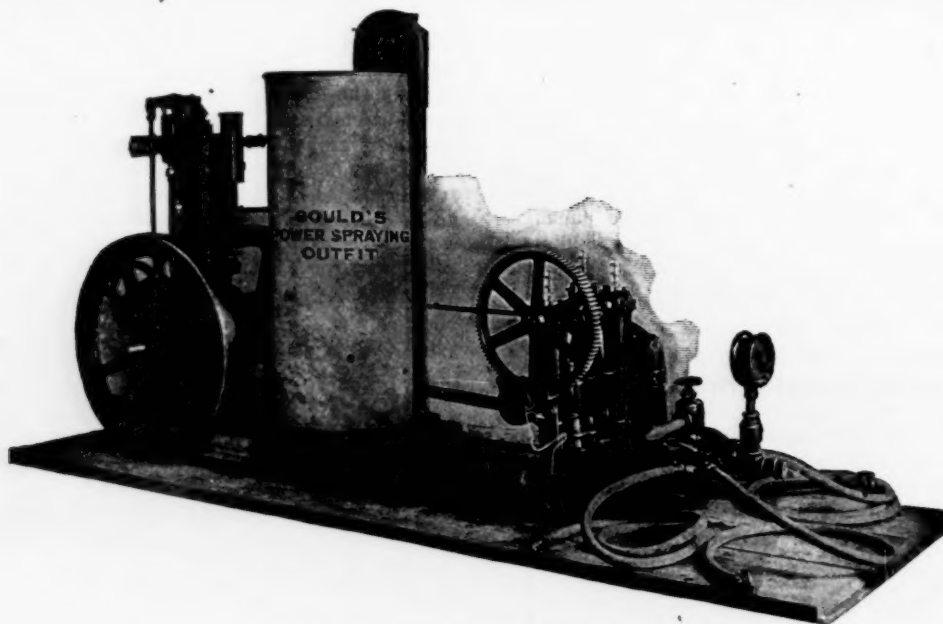


Fig. 1.—Goulds Power Spraying Outfit.

The outfit may be mounted on a wagon with tank as illustrated in Fig. 2, or a half-round tank to fit in the bolsters of a wagon will be furnished, and the outfit

vice is referred to as being simple, efficient in service and inexpensive. Two sizes of jaws are all that is required to fit any size of wrench. The manufac-

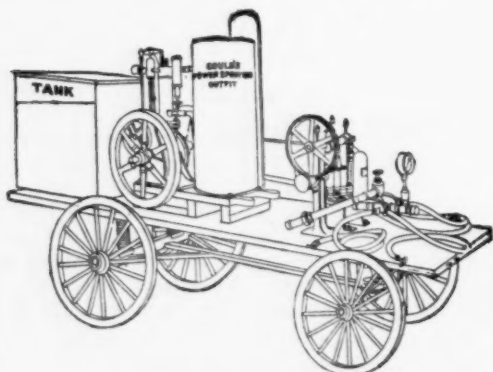


Fig. 2.—Spraying Outfit and Tank.

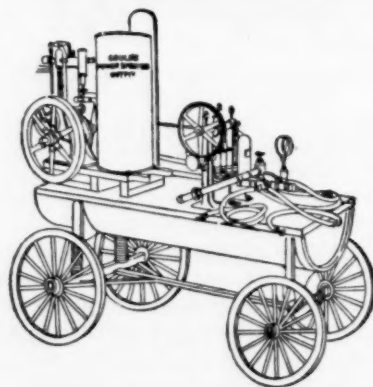


Fig. 3.—Spraying Outfit with Half Round Tank.

will be mounted on top by the manufacturers when so ordered. It is remarked that spraying outfits operated by a gasoline engine now find sale among the more progressive orchardists, and also among municipalities for protecting shade trees from ravages of insect pests; and that with these outfits spraying can be done very rapidly. About the farm a gasoline engine, it is pointed out, can be put to many uses outside of the spraying season.

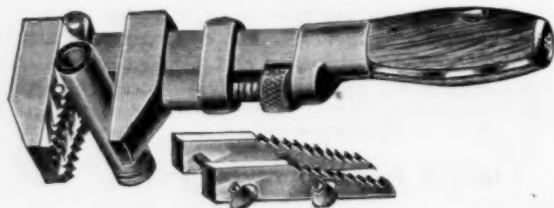
turers allude to the attachment as saving time and money.

Safety Screw Staple.

William F. Schall, 61 Barclay street, New York, for whom Frederick Pfeifer, 88 Chambers street, New York, is the sole selling agent, is manufacturing the Safety

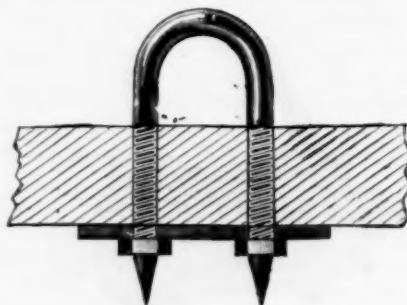
The Yankee Jaw.

The Wilcox Mfg. Company, Aurora, Ill., have just added to their line an attachment designed to fit any



The Yankee Jaw.

screw wrench which will quickly convert it into a pipe wrench. The device is herewith illustrated, the attachment being shown both separately and applied to a



Safety Screw Staple with Slotted Counterplate, Three-Fifths Size.

screw staple here illustrated. The feature of this staple is that it can be driven into or through a board, and quickly secured on the inner side by means of a rectangu-

lar slotted counter plate and two threaded nuts. It is especially recommended for store rooms, coal bins and similar places in apartments, flat houses, &c., which are much frequented by sneak thieves, who with a jimmy quickly and noiselessly withdraw the usual staple even when clinched. The sharpened points, if so desired, can be as quickly protected by forcing a piece of soft wood over them, holding it in position by driving a nail in the center of the piece through the slotted counter plate. The exact outer dimensions of the staple are $2\frac{1}{2} \times 1\frac{1}{2} \times 3$ -16 inches. The wrought iron counter plate is $2\frac{1}{2} \times \frac{5}{8}$ inches outside, with a rectangular slot or opening $1\frac{3}{8} \times \frac{1}{4}$ inch, through which the sharpened legs of the staple pass.

The Ferris Safety Clevis.

The Ferris Clevis Company, Oshkosh, Wis., have just brought out a safety clevis, which is herewith illustrated. The clevis is made wholly of malleable iron to render it

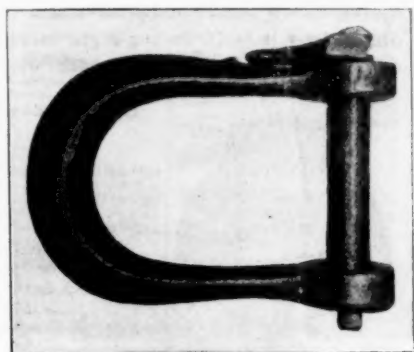


Fig. 1.—The Ferris Safety Clevis.

strong and durable. It is fitted with the Ferris patent lock, which is shown closed in Fig. 1 and open in Fig. 2. The lock prevents the bar working open, and is so easily adjusted that it can be either opened or closed instantly by a person wearing heavy mittens. This is referred to

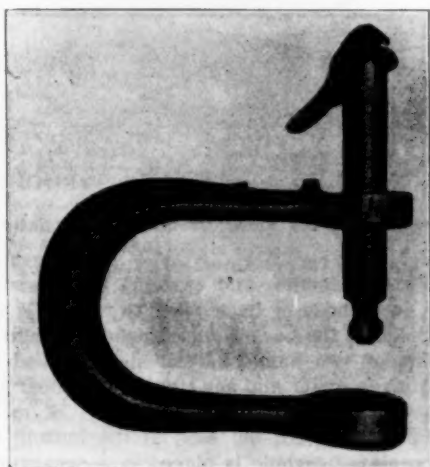


Fig. 2.—The Ferris Clevis Open.

as a great convenience during the winter. The company have issued a circular showing four sizes of this clevis being such as are generally used, but they are prepared to furnish any odd sizes desired.

An Adjustable Horse.

John S. Tilley, Watervliet, N. Y., is offering the adjustable horse shown in Fig. 1 of the accompanying cuts. The jacks shown in Fig. 2 are referred to as first-class in every detail, thoroughly ironed, bolted and riveted together, made of selected quality of spruce, which is dressed smooth and given a coat of oil. All the iron is wrought and malleable, finished in Japan.

Every piece is made by machinery and, it is remarked, can be duplicated, each iron piece being numbered. In Fig. 2 two jacks are shown knocked down. These are alluded to as being compact in form and as convenient for handling and moving about. The iron bracket

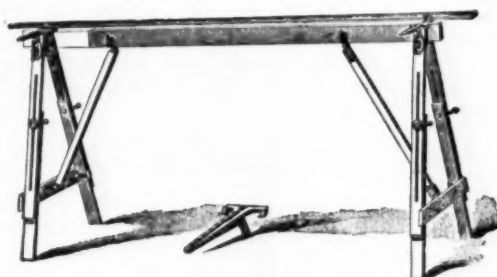


Fig. 1.—An Adjustable Horse.

shown immediately under the horse in Fig. 1 is 10 inches long, and is used when a platform is wanted on the horse. The brackets are hooked into malleable castings at the top of the leg, and will support a plat-



Fig. 2.—Jacks Knocked Down.

form 2 feet wide the whole length of the horse. This furnishes a convenient arrangement for moving about, working on side walls, or for use in narrow hallways.

The Willis Sap Spout.

The Hunting-Weekes Company, Watertown, N. Y., are offering the sap spout herewith illustrated. It is made in one piece of malleable iron, tinned. It is pro-



Fig. 1.—The Willis Sap Spout, Open Top.

vided with anchoring lugs to safely retain the spout in the tree when the sap freezes in the hole during extremely cold weather, and to prevent it being drawn



Fig. 2.—The Willis Sap Spout, Closed Top.

out by the weight of the bucket, or leaking when the sap begins to thaw. The manufacturers state that the spout cannot break, that it does not clog, and that it does not obstruct the flow of sap from the vertical pores

of the tree. The spouts are made open and closed tops, and to fit a hole bored with a $\frac{1}{2}$ -inch bit.

The Kitselman Post Hole Auger.

Kitselman Brothers, Muncie, Ind., are offering the post hole auger illustrated herewith. All the fittings are of malleable iron, and the blades are of new process steel. The front or cutting edges of the blades are ground and



Fig. 1.—The Kitselman Post Hole Auger.

tempered, while the backs of the blades are soft, to insure great cutting and wearing qualities. The auger is quick, efficient and easily worked, it is explained, four revolutions usually being sufficient to fill the space be-



Fig. 2.—The Kitselman Post Hole Auger, Open.

tween the blades. In ordinary soil a 3-foot hole, it is remarked, can be bored in one minute, and from 150 to 200 holes per day. It is pointed out that the dumping mech-

anism is entirely new in the manner in which it works, yet so simple and effective that it will discharge the most tenacious soil without trouble, and does away with the necessity of pounding the tool on the ground or of using a stick to get the dirt out of the auger. All the blades are radially adjustable to bore from $6\frac{1}{2}$ to 8 inch holes, thus obviating the necessity of having different size augers. Rule-like marks, $\frac{1}{4}$ inch apart, are on the disk head opposite the upper end of each blade, so that all blades can be quickly set exactly the same distance. By this arrangement the cutting edges of all the blades are always on the cutting line, a feature, it is stated, peculiar to this auger.

Baldwin Acetylene Yacht Cabin Lamp.

A. H. Funke, 101-103 Duane street, New York, has just put on the market the Baldwin acetylene yacht cabin lamp, as here illustrated, but which is also suitable for residence, office or other indoor habitation where such a lamp is desired. The metal portions are brass, the finish being either polished brass or nickel plate. In dimensions it is 15 inches high, including the porcelain dome shade; diameter of ball, $5\frac{1}{2}$ inches;



Baldwin Acetylene Yacht Cabin Swinging Lamp.

length of ball, 6 inches, and extreme distance from a cast brass escutcheon or back plate to front, $7\frac{1}{4}$ inches, the escutcheon at the back being 6 inches in height. The ball consists of two hemispherical shells joined at the center and made water and gas tight by a rubber gasket, the union being accomplished by means of an ornamental thumb nut with rod seen at the bottom of the body. Granulated carbide is placed in a separate inner shell in the bottom compartment, so that the outer shell is protected and its fine exterior appearance maintained. The water supply is carried in the upper half and introduced through an opening at the left, which is covered with a screw cap. The lava tip burner gives a brilliant white fish tail flame of high illuminating power. The point is made by the manufacturer that the lamp emits no odor, as in the event of a temporary excessive pressure a side tube conducts any surplus gas to the outside of the burner, where it is instantly consumed. The bent rod at the top on the right is merely to stir up the carbide in the lower receptacle after it is partially exhausted. Being designed particularly for yacht cabins it is so hung that it is always vertical in a sea way, the separation of the lamp from its bracket being accomplished by a sharp pull forward. There is no valve to get out of order and the mechanism of the lamp is very simple.

Gates, Molasses and Oil—

Steele's 30 @ 30 & 10%

Gauges—

Marking, Mortise, etc. 55¢ 10¢ 55¢ 10¢ 20%

Barrett's Comb. Roller Gauge 50¢ 75¢ 75¢ 25

Stanley R. & L. Co.'s Butt & Babbett 30¢ 10%

Wire, Brown & Sharpe's 35¢ 10%

Wire, Morse's 35¢ 10%

Wire P. S. & W. Co. 30¢ 30¢ 10%

Gimlets—Single Cut—

Nail, Metal, Assorted, gro. \$1.50 @ 1.80

Spike, Metal, Assorted, gro. \$2.80 @ 3.25

Nail, Wood Handled, Assorted, gro. \$1.75 @ 3.00

Spike, Wood Handled, Assorted, gro. \$3.25 @ 3.50

Glass, American Window

Jobbers' List, Jan. 21, 1901. 90%

Less than Car Lots from Store. 90%

Carloads from Store. 90¢ 75¢

Car Lot Consignments, f.o.b. factory. 90¢ 125¢

Glue—Liquid, Fish—

List A, Bottles or Cans, with Brush. 37¢ 1/2 @ 50%

List B, Cans (1/4 pts., pts., qts.). 37¢ 1/2 @ 50%

List C, Cans (1/2 gal., gal.). 25¢ 1/2 @ 50%

International Glue Co. (Marin's). 4¢ 10¢ 5%

Glue Pots—See Pots, Glue.**Grease, Axle—**

Common Grade. gro. \$5.00 @ 5.00

Dixon's Everlasting. 10¢ 10¢ 10¢ 5%

Dixon's Everlasting, in box, 4 doz. 1 b. \$1.20; 2 b. \$3.00

Snow Flake:

1 qt. cans, per doz. \$2.00; 2 qt., \$3.20; 3 gal. cans per doz. \$6.00; 3 gal. \$16.00; 5 gal. \$24.00

Grindstones—

Bicycle Grindstones, each \$2.50 @ 3.00

Pike Mfg. Co. Improved Family Grindstones, each, per doz. \$2.00 (38¢ 1/2)

Pike Mower Knife and Tool Grinders, each. \$1.00

Veez Ball Bearing, mounted, Angle Iron Frames each, \$3.25

Guards Snow—

Cave and Wire Spring Co. Galv. Steel per 1000 \$9.00

Copper per 1000 \$18.00

Gun Powder—See Powder.**Hack Saws—See Saws.****Hafts Awl—**

Pey Patent, Leather Top. \$1.50 @ 2.25

Pey Patent, Plain Top. \$3.50 @ 4.75

Sewing, Brass Ferrule. \$1.50 @ 1.50

Saddlers' Brass Ferrule. \$1.55 @ 1.55

Peg, Common. \$1.25 @ 1.25

Brad, Common. \$1.50 @ 1.75

Halters and Ties—

Covert Mfg. Co. Web 45¢ 25

Jute Rope 45¢ 25

Steel Rope 30¢ 25

Covert's Saddlery Works: Web and Leather Halters. 70%

Jute and Manila Rope Halters. 60¢ 20

Jute, Manila and Cotton Rope Ties. 70%

Sisal Rope Ties. 60¢ 20

Hammers—**Handled Hammers—**

Heller's Machinists' 50¢ 50¢ 25

Heller's Farriers' 50¢ 50¢ 25

Magnetic Tack, Nos. 1, 2, 3, 1.25, 1.50, 1.75, 2.00, 2.25, 2.50, 3.00, 3.50, 4.00, 4.50, 5.00, 5.50, 6.00, 6.50, 7.00, 7.50, 8.00, 8.50, 9.00, 9.50, 10.00, 10.50, 11.00, 11.50, 12.00, 12.50, 13.00, 13.50, 14.00, 14.50, 15.00, 15.50, 16.00, 16.50, 17.00, 17.50, 18.00, 18.50, 19.00, 19.50, 20.00, 20.50, 21.00, 21.50, 22.00, 22.50, 23.00, 23.50, 24.00, 24.50, 25.00, 25.50, 26.00, 26.50, 27.00, 27.50, 28.00, 28.50, 29.00, 29.50, 30.00, 30.50, 31.00, 31.50, 32.00, 32.50, 33.00, 33.50, 34.00, 34.50, 35.00, 35.50, 36.00, 36.50, 37.00, 37.50, 38.00, 38.50, 39.00, 39.50, 40.00, 40.50, 41.00, 41.50, 42.00, 42.50, 43.00, 43.50, 44.00, 44.50, 45.00, 45.50, 46.00, 46.50, 47.00, 47.50, 48.00, 48.50, 49.00, 49.50, 50.00, 50.50, 51.00, 51.50, 52.00, 52.50, 53.00, 53.50, 54.00, 54.50, 55.00, 55.50, 56.00, 56.50, 57.00, 57.50, 58.00, 58.50, 59.00, 59.50, 60.00, 60.50, 61.00, 61.50, 62.00, 62.50, 63.00, 63.50, 64.00, 64.50, 65.00, 65.50, 66.00, 66.50, 67.00, 67.50, 68.00, 68.50, 69.00, 69.50, 70.00, 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Ladies—Melting—
L. & W. Mfg. Co. 25¢
P. S. & W. 50¢
Reading, W. 60¢
Sargent's 40¢@40¢10¢

Lanterns—Tubular—
Regular 100 watt. doz. \$4.50@4.75
Side Lift Tubular. doz. \$4.75@5.25
Square Lift Tubular. doz. \$4.75@5.25
Other styles. 40¢10¢@40¢10¢5¢

Bull's Eye Police—
No. 1, 2 1/2 inch. \$5.60
No. 2, 3 inch. \$4.00

Latches, Thumb—
Roggin's Latches. doz. 30¢@35¢

Lawn Mowers—
See Mowers, Lawn.

Leaders, Cattle—
Small. doz. 50¢; large, 55¢
Cover Mfg. Co. 45¢

Lemon Squeezers—
See Squeezers, Lemon.

Lifters, Transom—
Solid Grip, Payson Mfg. Co. 80¢
R. & E. Mfg. Co. 45¢

Lines—
Wire Clothes, Nos. 13 19 20
100 feet. \$2.00 2.00 1.65
75 feet. \$1.80 1.70 1.30

Ossawa Mills—
Crown Solid Braided Chalk. 39¢45¢
Mason's, No. 0 to No. 3. 39¢45¢

Samson Cordage Works—
Solid Braided Chalk, No. 0 to 3. 40¢
Silver Lake Braided Chalk, No. 0, \$6.00;
No. 1, \$8.50; No. 2, \$7.00; No. 3, \$7.50
W. R. 30¢

Locks—Cabinet—
Cabinet Locks. 35¢40¢75¢
Door Locks, Latches, &c.—
[Net prices are very often made on
these goods.]

Reading Hardware Co. 50¢
R. & E. Mfg. Co. 60¢
Sargent & Co. 40¢40¢10¢

Elevator—
Stowell's 40¢

Padlocks—
Wrought Iron. 75¢10¢5¢@80¢5¢
R. & E. Mfg. Co. Wrt. Steel and Brass. 50¢

Sash, &c.—
Fitch's 60¢65¢
Bronze and Brass. 60¢65¢
Iron. 70¢

Ives Patent—
Bronze and Brass. 60¢65¢
If B. 65¢
Wrought Bronze and Brass. 65¢55¢
Wrought Steel. 60¢
Payson's signal. 80¢
Reading. 60¢10¢10¢70¢

Machines—Boring—
Common, Upright, Without Augers, \$9.00
Common, Angular, Without Augers, \$2.25

Without Augers.
R. & E. Mfg. Co.: Upright, Angular.
Improved No. 3, \$1.25 No. 1, \$1.50
Improved No. 4, 3.75 No. 2, 3.38
Improved No. 5, 2.75

Jennings. 2.50 3.00
Millers Falls. 5.75
Snell's, Rice's Pat. 2.50 2.75
Ewan's, No. 500. 5.10 No. 200 6.45

Holisting—
Moore's Anti-Friction Differential Pul-
ley Block. 30¢
Moore's Hand Holist, with Lock Brake. 30¢
Moore's Portable Pneumatic Holist. 25¢

Ice Cutting—
Chandler's 15¢

Washing—
Wayne American. \$ doz. \$28.00
Western Star, No. 2. \$ doz. 28.00
Western Star, No. 3. \$ doz. 30.00
St. Louis, No. 41. \$ doz. 60.00

Mallets—
Hickory. 45¢50¢
Lignumvitae. 45¢50¢
Timbers, Hickory and Applewood,
doz. 50¢55¢

Mate—Door—
Elastic Steel (W. G. Co.). 10¢

Mattocks—
See Picks and Mattocks.

Meat Cutters—
See Cutters, Meat.

Milk Cans—See Cans, Milk

Mills—Coffee—
Enterprise Mfg. Co. 25¢30¢
National, list. Can. 1, 9¢
Parker's Columbia and Victory. 90¢

Parker's Box and Slide. 50¢10¢60¢
Swift, Lane Bros. 30¢

Mincing Knives—
See Knives, Mincing.

Molasses Cates—
See Gates, Molasses.

Money Drawers—
See Drawers, Money.

Mowers, Lawn—
Net prices are generally quoted.
Cheap. all sizes, \$1.90@1.95
Good. all sizes, \$2.25@2.50
10 12 14 16 inch
High Grade 4.25 4.50 4.75 5.00
Continental. 60¢10¢5¢
Great American. 70¢5¢
Great American Ball Bearing. 60¢10¢5¢
Quaker City. 70¢5¢
Pennsylvania. 100¢10¢5¢
Pennsylvania Golf. 50¢
Pennsylvania Horse. 40¢
Pennsylvania Pony. 45¢
Philadelphia. 70¢5¢
Style A, S. C. K. T. 60¢10¢
Style A, All Steel. 60¢10¢
Style E, Low Wheel. 60¢10¢
Style E, High Wheel. 70¢10¢5¢
Drexel and Gold Coin, low list. 50¢5¢

Nails—
Out and Wire. See Trade Report.
Wire Nail and Brads, Papered.
List July 30, 1899. 85¢10¢35¢10¢10¢

**Hungarian, Finishing, Upholster-
ers', &c. See Tacks.**

Horse—
Nos. 6 7 8 9 10
A. C. 25¢ 25¢ 25¢ 21¢ 21¢ 40¢5¢
Ansable. 24¢ 24¢ 25¢ 24¢ 23¢ 50¢10¢
Capewell. 19¢ 18¢ 17¢ 16¢ 16¢ 10¢5¢
C. B. K. 25¢ 25¢ 25¢ 21¢ 21¢ 40¢
Champion. 20¢ 25¢ 25¢ 24¢ 23¢ 40¢10¢5¢

Clinto. 19¢ 17¢ 16¢ 15¢ 14¢ 30¢10¢5¢
Maud's. 25¢ 25¢ 25¢ 21¢ 21¢ 50¢
Nepouset. 23¢ 21¢ 20¢ 19¢ 18¢ 40¢
Putnam. 23¢ 21¢ 20¢ 19¢ 18¢ 39¢4¢
Vulcan. 23¢ 21¢ 20¢ 19¢ 18¢ 35¢10¢
American, Nos. 5 to 10. 30¢9¢4¢
Jobbers' special brands. per lb. 30¢9¢

Picture
1 1/2 2 3/4 5 5 1/2 in.
Brass Head. 15¢ 60¢ 70¢ 95¢ 100¢ gro.
Por. Head. 1.10 1.10 1.10 gro.

Nippers, See Pliers and Nippers.

Nut Crackers—
See Crackers, Nut.

Nuts—
Cold Punched: Off list.

Mfrs. or U. S. Standard.
Square, plain. \$5.00@5.10
Hexagon, plain. \$5.30@5.50
Square, C. T. & R. \$5.80@5.90
Hexagon, C. T. & R. \$5.80@5.90

Hot Pressed:
Mfrs. U. S. or Nar. Gauge Stand.
Square Blank. \$5.20@5.30
Hexagon Blank. \$5.80@5.90
Square Tapped. \$5.00@5.10
Hexagon Tapped. \$5.80@5.90

Oakum—
Best or Government. lb. 64¢
Navy. lb. 5¢
U. S. Navy. lb. 64¢
Plumbers' Spun Oakum. 84¢
In carload lots 1/4 lb. off f.o.b. New
York.

Oil Axle—
Snow Flake. \$3.00
1 qt. cans, per doz. \$4.80
1 gal. cans, per doz. \$15.00
5 gal. cans, per doz. \$66.00

Oil Tanks—See Tanks, Oil.

Oilers—
Brass and Copper. 40¢10¢50¢
Tin or Steel. 60¢10¢65¢
Zinc. 60¢10¢65¢

Paragon:
Brass and Copper. 40¢10¢
Tin or Steel. 60¢10¢
Zinc. 60¢10¢

Malleable, Hammers' Improved, No. 1.
\$3.50; No. 2, \$4; No. 3, \$4.40; No. 4, \$5.
Malleable, Hammers' Old Pattern,
same list. 50¢10¢
Wilmet & Hobbs Mfg. Co.:
Spring Bottom Cans. 70¢70¢10¢
Railroad Oilers etc. 60¢60¢10¢

Openers—Can—
French. doz. 35¢
Iron Hand. doz. 55¢70¢
Sprague, Iron Blade. per doz. 35¢40¢
Sardine Scissors. doz. \$1.75@3.00
Tip Top. per doz. 80¢75¢
National, W. gro. \$1.75@2.00
Stowell's. per doz. 35¢45¢
Waldorf, W. gro. 45¢

Egg—
Nickel Plate. per doz. 32.25
Silver Plate. per doz. 33.50

Packing—
Asbestos Packing, Wick and Rope, 15¢15¢10¢lb.

Rubber—
Sheet, C. I. 8¢10¢
Sheet, C. O. S. 9¢10¢
Sheet, C. B. S. 10¢10¢
Sheet, Pure Gum. 50¢70¢
Shr. d. Red. 35¢40¢
Jenkins' Standard. 35¢40¢

Miscellaneous
American Packing. 75¢10¢lb.
Cotton Packing. 13¢10¢lb.
Italian Packing. 9¢10¢lb.
Jute. 3¢10¢lb.
Russia Packing. 7¢10¢lb.

Pails—Creamery
S. S. & Co., with gauges. No. 1 \$6.50;
No. 2, \$5.75; No. 3, \$5.00.

Galvanized—
Price per gro.

Quart. 10 12 14
Water, Regular. 18.00 21.00 24.00
Water, Heavy. 21.00 27.00 30.00
Fire, Rd. Bottom. 31.00 35.00 35.00
Well. 27.00 29.00 31.00

Pans—Dripping—
Standard List. 50¢10¢50¢10¢

Fry—
Common Lipped:
No. 1 2 3 4 5
Per doz. \$1.90 75 85 95 1.15

Roasting and Baking—
Regal, S. S. & Co., W. doz. Nos. 5, \$1.50;
10 \$5.00; 20 \$5.50; 30 \$6.00.
Simplex, W. gro. No. 40 \$30.00; 50,
\$34.50; 60 \$39.00; 140, \$38.00; 150,
\$37.50; 160, \$43.00.

Paper—Building Paper—
Asbestos. lb.

Building Felt. 5¢
Mill Board, sheet, 1/4 to 1/2 inches. 4¢
**Mill Board, roll, thicker than 1-18
inch. 3¢**
**Mill Board, roll, 1-18 in. thick and
less. 3¢**

Per roll
Rosin Sized Sheathing: 500 sq. ft.
Light wt., 30 lbs. to roll. \$0.38
Medium wt., 37 lbs. to roll. \$0.47
Heavy wt., 40 lbs. to roll. \$0.53
Medium Grades Water Proof
Sheathing. \$0.65@1.25
Deafening Felt, 2, 3 and 4 1/2 sq. ft.
to lb., ton. \$4.00@12.00

**Red Rope Roofing, 250 sq. feet per
roll. \$1.65**

Tarred Paper.
1 ply (roll 300 sq. ft.), 100. \$8.00@10.00
2 ply, roll 108 sq. ft. 40¢45¢
5 ply, roll 108 sq. ft. 60¢65¢
Slater's Felt (roll 500 sq. ft.). 60¢60¢
R. M. Stone Surfaced roofing (roll
110 sq. ft.). \$2.75

Sand and Emery—
List Dec. 23, 1899. 60¢10¢50¢10¢10¢

Parers—Apple—
Advance. \$ doz. \$4.50
Baldwin. each \$5.00
Bonanza. each \$7.50
Dandy. each \$16.00
Eureka, 1898. each \$12.00
Family Bay State. \$ doz. \$4.00
Hudson's Little Star. \$ doz. \$5.50
Hudson's Rocking Table. \$ doz. \$5.50
Improved Bay State \$ doz. \$27.00@30.00
New Lightning. \$ doz. \$5.50
Reading 72. \$ doz. \$4.00
Reading 78. \$ doz. \$7.00
Turn Table '98. \$ doz. \$5.50
White Mountain. \$ doz. \$4.00

Potato—
Baratone. \$ doz. \$5.50
White Mountain. \$ doz. \$4.50

Picks and Mattocks—
List Feb. 23, 1899. 70¢70¢10¢

Pigeons—Clay
Markie's Black Birds, f.o.b. factory,
per M. \$3.75
See also Traps, Target.

Pinking Irons—
See Irons, Pinking.

Pins—Escutcheon—
Brass. 60¢
Iron, list Nov. 11, '85. 60¢

Pipe, Cast Iron Soil—
Standard, 2-6 in. 60¢7 1/2¢
Extra Heavy, 2-6 in. 70¢
Fittings. 75¢5¢
NOTE.—Carload lots to jobbers 10% less,
and freight allowed.

**Pipe, Merchant, Boiler
Tubes, &c.—**
Less than Carloads to Consumers.

Merchant Pipe.
Galva- nized
1/4 to 1/2 inch. 61¢
3/4 to 10 inch. 63 1/2¢
Boiler Tubes
Up to
10 inch and 1 1/2 to 5 inch in-
clusive. 65 1/2¢
2 to 2 1/2 inch, inclusive. 60¢
6 to 10 inches. 59¢
Iron.
10 1/2 inch and 1 1/2 in. 45 1/2¢
1 1/2 to 2 inch. 45¢
3/4 to 1 inch. 53¢
Casing, Cut Lengths. S. & S.
3/4 to 1 inch. 53 1/2¢
3/4 to 1 1/2 inch. 61 1/2¢
NOTE.—Prices are largely nominal on-
ing to scarcity of Pipe. Jobbers are ob-
taining almost any price they ask.

Pipe, Sewer—
Standard Pipe and Fittings, 3 to 4 in.
New England. 70¢
New York and New Jersey. 75¢
Ohio and Michigan. 8 1/4¢
Carload lots are generally deliv-
ered.

Planes and Plane Irons—
Wood Planes—
Molding. 40¢2 1/2¢@40¢10¢
Bench, First quality. 45¢10¢@45¢10¢5¢
Bench, Second quality. 60¢10¢@50¢10¢5¢
Bailey's (Stanley R. & L. Co.)
50¢10¢@50¢10¢10¢
Gage Self Setting. 35¢
Bailey's (Stanley R. & L. Co.)
50¢10¢@50¢10¢10¢
Chaplin's Iron Planes. 50¢10¢
Miscellaneous Planes (Stanley R. & L.
Co.). 25¢10¢@25¢10¢10¢
Sargent's. 50¢10¢10¢

Plane Irons—
Wood Bench Plane Irons—
Buck Bros. 50¢@50¢10¢5¢
Stanley R. & L. Co. 50¢10¢@50¢10¢10¢
L. & J. White. 20¢5¢25¢

Planters, Corn, Hand.
Kohler's Eclipse. \$ doz. \$9.00

Plates—
Felloe. lb. 3 1/2¢@4¢
Self-Sealing Pie Plates (S. S. & Co.),
\$ doz. \$2.00

Pliers and Nippers—
Button Pliers. 70¢10¢75¢
Gas Burner, per doz., 5 in., \$1.15@
\$1.20; 6 in., \$1.35@1.45
Gas Pipe. 7 8 10 12 in.
\$1.75 \$2.00 \$2.75 \$3.75
Acme Nippers. 50¢50¢5¢
Bernard's:
Parallel Pliers, 20. 35¢
Paragon Pliers. 50¢5¢
Lodi Pliers. 50¢5¢
Elm City Fence Pliers. 35¢
Cronk Hanger Co.:
American Button. 75¢10¢
Cronk's. 80¢
Improved Button. 70¢10¢
Sargent's Pattern. 50¢
Combination and others. 25¢
Heiler's Farriers' Nippers, Pincers
and Tools 50¢50¢5¢
P. S. & W. Tinnars' Cutting Nippers,
30¢30¢10¢
Swedish Side, End and Diagonal Cut-
ting Pliers. 80¢
Utica Drop Forge & Tool Co.:
Pliers and Nippers, all kinds. 40¢

Plumbs and Levels—
Plumbs and Levels. 75¢75¢10¢

Davis Iron, Machinist Nos. 1 to 14. 25¢
Davis Iron, adjustable Nos. 6 to 49. 35¢
Disston's. 70¢
Pocket Levels. 70¢10¢10¢75¢10¢
Stanley R. & L. Co. 70¢10¢70¢10¢10¢

Stanley's Duplex. 25¢10¢25¢10¢10¢
Woods' Extension. 39¢4¢

Poachers, Egg—
Buffalo Steam Egg Poachers, \$ doz.
No. 1, \$7.20; No. 2, \$11.00 No. 3,
\$11.00; No. 4, \$14.50. 50¢

Points, Glaziers—
Bulk and 1 lb. papers. lb. 8¢
1/4 lb. papers. lb. 8 1/2¢
1/4 lb. papers. lb. 9¢

Pokes, Animal—
Ft. Madison Hawkeye. \$ doz. \$3.25
Ft. Madison, Western. \$ doz. \$3.75

Police Coods—
Manufacturers' Lists. 25¢@25¢10¢
Tower's. 25¢

Polish—Metal—
Prestoline Liquid, No. 1 (1/4 pt.), \$ doz.
\$5.00; No. 2 (1 qt.), \$9.75. 40¢10¢
Prestoline Paste. \$ gr. \$3.50
George William Hoffman:
U. S. Metal Polish Paste, 3 oz. boxes, \$
doz. 50¢; \$ gr. \$4.50; 1/2 lb. boxes, \$
doz. \$1.25; 1 lb. boxes, \$ doz. \$2.25;
U. S. Liquid, 8 oz. cans, \$ doz. \$1.25;
\$ gr. \$12.00.
Barkeepers' Friend Metal Polish, \$ doz.
\$1.75; \$ gr. \$18.00.
Wynn's White Silk, 1/4 pt. cans, \$
doz. \$2.00

Stove—
Black Eagle Benzine Paste, 5 lb. cans. \$ 10¢
Black Eagle, Liquid, 1/4 pt. cans. \$ 10¢

Black Jack Paste, 1/4 lb. cans. \$ doz. 75¢
Ladd's Black Beauty, \$ gr. \$10.00. 50¢
Joseph Dixon's, \$ gr. \$5.75. 10¢
Dixon's Plumbago. 8¢
Fireside. \$ gr. \$2.50
Gem, \$ gr. \$4.50. \$ gr. \$2.50
Japanese. \$ gr. \$2.50
Jet Black. \$ gr. \$3.50
Peerless Iron Enamel, 1/4 pt. cans. \$ doz. \$1.50

Wynn's:
Black Silk, 5 lb. pail. each 70¢
Black Silk, 1 lb. box. \$ doz. \$1.00
Black Silk, 5 oz. box. \$ doz. \$0.75
Black Silk, 1/4 pt. liq. \$ doz. \$1.00

Poppers, Corn—
Round or Square:
1 qt. gro. \$7.00@7.50
1 1/2 qt. gro. 9.50@10.00
3 qt. gro. 10.50@11.00

**Post Hole and Tree Aug-
ers and Diggers—**
See also Diggers, Post Hole, &c.

Potato Parers—
See Parers, Potato.

Pots—Glue—
Enamelled. 45¢
Tinned. 40¢

Powder—
In Canisters:
Duck, 1 lb. each. 45¢
Fine Sporting, 1 lb. each. 75¢
Rifle, 1/4 lb. each. 15¢
Rifle, 1 lb. each. 25¢

In Kegs:
Duck, 6 1/2 lb. kegs. \$1.35
Duck, 12 1/2 lb. kegs. \$1.25
Duck, 25 lb. kegs. \$5.00
Rifle, 6 1/2 lb. kegs. \$1.35
Rifle, 12 1/2 lb. kegs. \$1.35
Rifle, 25 lb. kegs. \$5.00

King's Semi-Smokeless:
Keg (25 lb. bulk). \$5.50
Half Keg (12 1/2 lb. bulk). \$3.00
Quarter Keg (6 1/2 lb. bulk). \$1.90
Case 24 (1 lb. cans bulk). \$5.50
Half case (1 lb. cans bulk). \$4.50
King's Smokeless: Shot Gun Rifle
Keg (25 lb. bulk). \$12.00
Half Keg (12 1/2 lb. bulk). \$7.75
Quarter Keg (6 1/2 lb. bulk). \$3.35
Case 24 (1 lb. cans bulk). 14.00
Half case 12 (1 lb. cans bulk). 8.75

Presses—
Fruit and Jelly—
Enterprise Mfg. Co. 30¢35¢

**Pruning Hooks and
Shears—See Shears.**

Pullers, Nail—
Cyclops. 40¢40¢10¢
Smith & Hemenway Co.:
Diamond B. No. 2 case lots, \$ doz \$8.00
Diamond B. No. 2 case lots, \$ doz \$5.50
Giant, No. 1, \$ doz. \$18; No. 2, \$15.00;
No. 3, \$15. 40¢
Miller's Falls, No. 3, per doz. \$19.00

Pelican \$ doz. \$9.00. 15¢10¢
Seranton, Case Lots:
No. 1 (large), \$ doz. \$1.50; No. 2 (large),
\$5.75; No. 3 (small), \$5.00; No. 2-B (large),
\$5.50; No. 3-B (small), \$5.00; No. 2-D
(large), \$4.50; No. 3-D (small) \$4.00.

Pulleys—Single Wheel—
Inch. 2 1/2¢
Auming. \$0.45 70 95
Inch. \$ 1 1/4 1 1/2

Hay Fork, Swivel or Solid Eye. \$1.55@1.60
Hot House. \$ doz. \$1.55@1.60
Inch. 1 1/4 1 1/2 1 3/4 2 1/4 3 1/4
Screw. \$ doz. \$0.15 20 25 30
Inch. 1 1/4 1 1/2 1 3/4 2 1/4 3 1/4
Side. \$ doz. \$0.30 40 55 60
Inch. 1 1/4 1 1/2 1 3/4 2 1/4 3

Jobbers \$0.50@1.00, and Common, Plain
Black Shotels are generally sold by jobbers
at about \$1.00.

Sieves and Sifters—

Hunter's Imitation, gro. \$11.00@11.50
Buffalo Metallic Blue, S. & Co., \$ gr.
14x18 18x20
12x30 \$15.80 15.00
F. J. Meyers' Mfg. Co.:
Eolips, \$ gr. \$11.00
Electric Light, \$ gr. \$11.00
Hunter's Genuine, \$ gr. \$12.50
No Name, Hunter's, \$ gr. \$11.00
Standard, \$ gr. \$11.00
Shaker (Barber's Pat.) Flour Sifters,
\$ doz. \$2.00. \$0.00

Sieves, Tin Rim—

Per dozen
Mesh, 14 16 18 20
Black, full size, \$0.95 98 1.00 1.10
Plated, full size, \$1.05 1.08 1.10 1.20
Black, scan, \$0.78 80 .83

Sieves, Wooden Rim—

Nested, 10, 11 and 12 Inch.
Mesh 18, Nested, doz. \$0.65@0.75
Mesh 20, Nested, doz. .75@.85
Mesh 24, Nested, doz. .90@1.00

Sinks—Cast Iron—

Standard list, \$5@10@70. \$
NOTE.—There is not entire uniformity
lists used by jobbers.

Wrought Steel—

New Era, Galv'd and Enamelled, 70x54
New Era, Painted, 50x104
L. & G. Mfg. Co., Galvanized, 50x
L. & G. Mfg. Co., Enamelled, 50x

Skels, Wagon—

Cast Iron, 70x10@75
Malleable Iron, 10x10@50
Steel, 10x10@104

Slates—

Factory Shipments.
"D" Slates, 50x10@104
Unexcelled, etc., Noiseless Slates, 60
x 8 tens 4

Victoria, etc., Noiseless Slates, 60x
7 tens 4x5

Wire Bound, 50x10@54

Web Hinge, 50x10@54

Slaw Cutters—See Cutters.

Slicers, Vegetable—

Sterling \$2.00. 33x4

Snaps, Harness—

German, 40x10@104

Covert Mfg. Co., 35x25

Deroy, 45x25

High Grade, 45x25

Jockey, 45x25

Trojan, 45x25

Yankee, 35x25

Yankee, Roller, 30x25

Covert's Saddlery Works:

Crown, 60x

German, 60x

Model, 60x

Triumph, 60x

W. & E. T. Fitch Co.:

Empire, 40x104

German, 50x55

National, 50x55

Perfect, 45x

Clipper, 40x

Champion, 40x

Security, 40x

Victor, 60x55

Onida Community:

Solid Steel, 55x55@104

Solid Steel, 55x55@104

Sargent's Patent Guarded, 60x104

Snaths—

Scythe, 60x50@104

Snips, Tinnners'—See Shears.

Soldering Irons—

See Irons, Soldering.

Spoke Trimmers—

See Trimmers, Spoke.

Spoons and Forks—

Silver Plated—

Good Quality, 50x10@60x10@54

Cheap, 60x60@104

International Silver Co.:

1847 Rogers Bros. and Rogers & Ham-
ilton, 40x104

Rogers & Bro., William Rogers Eagle
Brand, 50x104

Anchor, Rogers Brand, 60x

Wm. Rogers & Son, 60x104

Simon L. & Geo. H. Rogers Co.:

Silver Plated Flat Ware, 60x

No. 77 Silver Plated Ware, 60x104

Miscellaneous—

German Silver, 60x10@60x10@104

Simon L. & Geo. H. Rogers Co.:

German or Nickel Silver, Special list
1. 10x

Tinned Iron—

Teas, per gro. 45@50c

Tables, per gro. 90c@1.00

Springs—

Door—

Gem (Coll), 30x

Star (Coll), 30x

Torrey's Rod, 99 in., \$ doz. \$1.10@1.25

Victor (Coll), 50x10@104

Carriage, Wagon, &c.

1 1/4 in. and wider:

Black or 1/4 Bright, lb. 4x4c

Bright, lb. 5x4c

Painted Seat Springs:

1 1/2 x 2 1/2 and smaller, per pr 60@55c

1 1/2 x 2 1/2, per pr. 53@50c

1 1/2 x 2 1/2 and narrower, per pr. 80@85c

Cliff's Springs:

Bolster, 40x

Seat, per pair, 50c

Pole, per pair, 1/4 in. \$1.10; 1/2 in. \$1.25

Sprinklers, Lawn—

Enterprise, 25@29x

Philadelphia No. 1, \$ doz. \$12; No. 2,
\$15; No. 3, \$24. 30x

Squares—

Nickel plated, List Jan. 5, 1901

Steel and Iron, 70x10@75x

Rosewood Hdl Try Square and T-
Bevels, 60x10@104

Iron Hdl. Try Squares and T-Bevels.

40x10@104x10@104

Diston's Try Sq. and T-Bevels, 60x104

Winterbottom's Try and Miter, 50x104

Squeezers—

Lemon—

Wood, Common, gro., No. 9, \$5.25

\$5.50; No. 1, \$6.50@6.50.

Wood, Porcelain Lined:

Cheap, \$3.00@2.75

Good Grade, \$5.00@5.50

Tinned Iron, \$5.00@5.50

Iron, Porcelain Lined doz. \$5.50@5.75

Jennings' Star, \$ doz. \$1.85@1.90

Staples—

Barbed Blind, lb. 6@4c

Electricians', Association list, 80x10@104

Fence Staples, same price as Barbed
Wire. See Trade Report.

Poultry Netting, Staples, per lb. 54@54c

Grand Crossing Tack Co.'s list, 80x104

Steels, Butchers—

Dick's, 30x

Foster Bros', 30x

Hartzell Cutlery Co., 30x55

C. & A. Hoffmann's, 40x

Steelyards, 25@25@104

Stocks and Dies—

Blacksmiths', 40x10@104

Gardner Die Stocks No. 1, 50x

Gardner Die Stocks, larger sizes, 40x

Green River, 25x

Lightning Screw Plate, 25x

Little Giant, 25x

Revere's New Screw Plates, 25x30x

Curtis Reversible Ratchet Die Stock, 35x

Stone—

Chicago Wheel & Mfg. Co.:

Gem Corundum, 10 inch, \$3.00 per
gro. 12 inch, \$10.4

Pike Mfg. Co. 1901 list:

Black Diamond S. S., \$ gro. \$12.00

Lamotte S. S., \$ gro. \$11.00

White Mountain S. S., \$ gro. \$9.00

Green Mountain S. S., \$ gro. \$6.00

Extra Indian Pond S. S., \$ gro. \$7.50

No. 1 Indian Pond S. S., \$ gro. \$7.00

No. 2 Indian Pond S. S., \$ gro. \$4.50

Leader Red End S. S., \$ gro. \$4.50

Balance of 1901 list 33x4

Oil Stones, &c.

Chicago Wheel & Mfg. Co. 1901 list:

Gem Corundum Oil, Double Grit, 50x

Gem Corundum Oil, Single or Double
Grit, 50x

Gem Corundum Slips, 55x

Gem Corundum Razor Hones, 50x

Pike Mfg. Co. 1901 list:

Arkansas Stone, No. 1, 3to5 in. \$5.50

Arkansas Stone, No. 1, 5to8 in. \$5.50

Arkansas Slips No. 1, 50x

Lily White Washita, 4 to 8 in., 60x

Road Red Washita, 4 to 8 in., 60x

Washita Stone, Extra, 4 to 8 in., 50x

Washita Stone, No. 1, 4 to 8 in., 30x

Washita Stone, No. 2, 4 to 8 in., 30x

Washita Slips, Extra, 50x

Washita Slips, No. 1, 70x

India Oil Stones (entire list) 25x

Hindustan No. 1, Regular, \$ doz. 8x4

Hindustan No. 1 Small, \$ doz. 10x

Axe Stones (all kinds) 33x4

Turkey Oil Stones, ex. 5 to 8 in. \$5.50

Queer Creek Stones, 4 to 8 in., 30x

Queer Creek Slips, 40x

Sand Stone, 40x

Belgian, German and Swaty Razor
Hones, 40x

Natural Grit Carving Knife Hones,
\$ doz. \$3.00

Quick Edge Pocket Knife Hones,
\$ doz. \$3.00

Mounded Kitchen Saus Stone, \$ doz.
\$1.50

Tanite Mills:

Emery Oil, \$ doz. \$5.00. 50@60x

Stoners—

Enterprise, 25@30x

Stops, Bench—

Millers' Falls, 15x104

Morrill's, \$ doz. No. 1, \$10.00, 50x204

Morrill's, No. 2, \$11.00, 50x204

Stops, Window—

Ives' Patent, 25x54

Stove Boards—

See Boards, Stove.

Stove Polish—See Polish, Stove.

Strainers, Pump—

Diamond Joe Pump Strainers, per doz. \$

Straps, Box—

Cary's Universal case lots, 20x104

Stretchers, Carpet—

Cast Iron, Steel Points, doz. 55@55c

Socket, 50x10@104

Strops, Razor—

Smith & Hemenway Co., 70x

Stuffers, Sausage—

Enterprise Mfg. Co., 25@25x74x

National Specialty Mfg. Co. list Jan.
1, '97. 30x

Tacks Brads, &c.—

List Jan. 15, '99.

Carpet Tacks, American 90x25@54

American Cut Tacks, 90x20@54

Suedes Iron Tacks, 90x20@54

Suedes Upholsterers' Tacks, 90x10@54

Gimp Tacks, 90x10@54

Lace Tacks, 90x10@54

Trimmers' Tacks, 90x25@54

Looking Glass Tacks, 70x104

Bill Posters' and Railroad Tack, 90x50@54

Hungarian Nails, 80x15x

Common and Patent Brads, 80x104

Trunk and Clout Nails, 90x54

NOTE.—The above prices are for
straight weights. An extra 5% is given
Star Weights and an extra 10% on
Standard Weights.

Miscellaneous—

Double Point Tacks, 90x5 or 7 tens

Steel Wire Brads, R. & E. Mfg.

Co.'s list, 50x10@60x

See also Nails, Wire.

Tanks, Oil—

Emerald, S. S. & Co., 30-gal. \$3.90

Emerald, S. S. & Co., 50-gal., \$4.00

Queen City S. S. & Co., 30-gal., \$3.50

Queen City S. S. & Co., 60-gal., \$4.35

Tapes, Measuring—

American Asses' Skin, 40x10@50x

Patent Leather, 25x50x54

Steel, 40x10@54

Chesterman's, 40x25x54

Eddy's Metallic, 40x10@54

Eddy's Metallic, 30x4x54

Keuffel & Esser Co. Steel and Metallic,
Lower list, 1899, 35x

Lufkin's Steel, 33x4x54

Lufkin's Metallic, 80x30x54

Teeth Harrow—

Steel Harrow Teeth, plain or head-
ed, base per lb. 54c

Brass Surface:
Brass King, Single Surface, open
back.....\$3.00
Nickel Plate Surface:
No. 1001 Nickel Plate, Single Surface.....\$3.00

Washers—

Leather, Axle—
Solid.....\$5.10 to \$10.00
Washers.....\$5.10 to \$10.00
Coll: 1/2 1 1 1/2 1 3/4 1 1/2 Inch.
100 110 120 130 per 100

Iron or Steel

Size bolt.... 5-18 3/4 1/2 3/8 5/16 3/16
Washers.....\$5.10 to \$10.00
In lots less than one keg add 1/4c per
lb., 5-lb. boxes add 1/4c to list.

Cast Washers—

Over 1/2 inch, barrel lots, per lb.....1 1/4 to 1 3/4c

Washer Cutters—

See Cutters, Washer.

Washing Machines—

See Machines, Washing.

Water Coolers—

See Coolers, Water.

Wedges—

Oil Finish.....lb. \$2.00 to \$3.10c

Weights, Sash—

Per ton, f.o.b. factory.....\$1.00 to \$2.00

Some Foundries make price \$1.00 to \$1.50 lower.
Well Buckets, Galvanized
See Pauls, Galvanized.

Wheels Well—

8-in. \$1.45 to \$1.65; 10-in. \$1.75 to \$2.00;
12-in. \$2.35 to \$2.50; 14-in. \$3.50 to \$3.75

Wire and Wire Goods—

Bright and Annealed:

6 to 18.....7 1/2 to 10¢
10 to 18.....7 1/2 to 10¢
19 to 26.....7 1/2 to 10¢
27 to 36.....7 1/2 to 10¢

Galvanized:

6 to 18.....7 to 10¢
10 to 18.....7 to 10¢
19 to 26.....7 to 10¢
27 to 36.....7 to 10¢

Coppered:

6 to 18.....7 to 10¢
10 to 18.....7 to 10¢
19 to 26.....7 to 10¢
27 to 36.....7 to 10¢

Tinned:

6 to 18.....7 to 10¢
10 to 18.....7 to 10¢
19 to 26.....7 to 10¢
27 to 36.....7 to 10¢

Annealed Wire on Spools—

70 to 100 ft. 7 to 10¢
100 to 200 ft. 7 to 10¢
200 to 300 ft. 7 to 10¢
300 to 400 ft. 7 to 10¢

Brass and Copper Wire on Spools—

80 to 100 ft. 7 to 10¢

Brass, list Feb. 28, '96.....25¢

Copper, list Feb. 28, '96.....15¢

Cast Steel Wire.....50¢

Stubs' Steel Wire.....\$6.00 to \$2.40¢

Wire Clothes Line, see Lines.

Wire Picture Cord, see Cord.

Bright Wire Goods—

List April 1, 1901.....\$5.10 to \$10.00

Wire Cloth and Netting—

Galvanized Wire Netting.....\$0.20 to \$1.00

Painted Screen Cloth per 100 ft.....\$1.00

Light Hardware Grade:

1/8 Mesh, Plain (Sc. list) sq. ft. 1 1/4 to 1 3/4c

1/8 Mesh, Galv. (Sc. list) sq. ft. 1 1/4 to 1 3/4c

Wire, Barb—See Trade Report.**Wire Rope—See Ropes, Wire.****Wrenches—**

Agricultural.....70¢ to 10¢

Case lots.....75¢ to 10¢

Acme.....60¢ to 10¢

Allicator.....60¢ to 10¢

Baxter's S.....60¢ to 10¢

Bull Dog.....70¢

Bemis & Co's.....35¢ to 5¢

Adjustable S.....40¢ to 10¢

Bridge's Pattern.....30¢ to 10¢

Combination Black.....40¢ to 5¢

Combination Bright.....40¢

Cylinder or Gas Pipe.....45¢

Extra Heavy.....50¢

Merrick's Pattern.....50¢

No. 3 Pipe, Bright.....50¢

Bindley Automatic.....30¢

Boardman's.....33¢

Coe's Genuine.....40¢ to 10¢

Coe's "Mechanics".....40¢ to 10¢

Donohue's Engineer.....50¢ to 10¢

Eagle.....50¢ to 10¢

Elgin Wrenches.....40¢

Elgin Monkey Wrench Pipe Jaws.....33¢

Gem Pocket.....30¢

Hercules.....70¢

Knife Handle, Machinists' (W. & B.).....50¢ to 10¢

Less than case lots.....50¢ to 10¢

Improved Pipe (W. & B.).....50¢ to 10¢

Solid Handle, P.S. & W.....50¢ to 10¢

Triumph.....60¢ to 10¢

Wrought Goods—

Staples, Hooks, &c., list March 17.....90¢ to 10¢

Yokes Neck—

Covert Saddlery Works, Trimmed.....60¢ to 5¢

Covert Saddlery Works, Neck Yoke.....70¢

Centers.....50¢

Yokes, Ox, and Ox Bows—

Fort Madison's Farmers & Freighters.....list act

Zinc—

Sheet.....lb 6¢ to 6 1/2¢

PAINTS, OILS AND COLORS—Wholesale Prices.**White Lead, Zinc, &c.**

Lead, English white, in Oil.....@ 9 1/2

Lead, American White, in Oil:

Lots of 500 lb or over.....@ 6 1/2

Lots less than 500 lb.....@ 7

Lead, White, in Oil, 35 lb tin

pails, add to keg price.....@ 1 1/2

Lead, White, in Oil, 1 1/2 lb tin

pails, add to keg price.....@ 1

Lead, White, in Oil, 1 to 5 lb as-

sorted tins, add to keg price.....@ 1 1/2

Lead, White, Dry in bbls.....@ 3 1/2

Lead, American, Terms: On lots of 500

lbs. and over, 60 days, or 25 for cash if

paid in 15 days from date of invoice.

Zinc, American, dry.....@ 4 1/2

Zinc, Paris, Red Seal, dry.....@ 3 1/2

Zinc, Paris, Green Seal, dry.....@ 3 1/2

Zinc, Antwerp, Red Seal, dry.....@ 3 1/2

Zinc, Antwerp, Green Seal, dry.....@ 3

Zinc, V. M. French, in Poppy Oil,

Green Seal:

Lots of 1 ton and over.....@ 12 1/2

Lots less than 1 ton.....@ 13 1/2

Zinc, V. M. French, in Poppy Oil,

Red Seal:

Lots of 1 ton and over.....@ 10 1/2

Lots less than 1 ton.....@ 11 1/2

Discounts.—V. M. French Zinc.—Dis-

counts to buyers of 10 bbl. lots of one or

assorted grades, 1 1/2; 25 bbls, 2 1/2; 50

bbls., 4 1/2.

Dry Colors.

Black, Carbon.....@ 8 @ 30

Black, Drop, Amer.....@ 4 @ 7

Black, Drop, Eng.....@ 12 @ 11

Black, Ivory.....@ 12 @ 11

Lamp, Com.....@ 4 1/2 @ 6

Blue, Celestial.....@ 4 @ 6

Blue, Chinese.....@ 30 @ 35

Blue, Prussian.....@ 28 @ 34

Blue, Ultramarine.....@ 4 @ 30

Brown, Spanish.....@ 1 @ 1

Brown, Vandyke, Amer.....@ 1 1/2 @ 2 1/2

Brown, Vandyke, Foreign.....@ 3 1/2 @ 3 1/2

Carmine, No. 40.....@ 3 1/2 @ 2 1/2

Green, Chrome, ordinary.....@ 5 @ 6 1/2

Green, Chrome, pure.....@ 16 @ 29

Lead, Red, bbls. 1/2 bbls. and kegs:

Lots 500 lb or over.....@ 6

Lots less than 500 lb.....@ 6 1/2

Litharge, bbls. 1/2 bbls. and kegs:

Lots 500 lb or over.....@ 6

Lots less than 500 lb.....@ 6 1/2

Ocher, French Washed.....@ 1 1/2 @ 1 1/2

Ocher, Dutch Washed.....@ 4 1/2 @ 5

Ocher, American.....@ 10 @ 15.00

Orange Mineral, English.....@ 8 @ 11 1/2

Orange Mineral, French.....@ 11 1/2 @ 11 1/2

Orange Mineral, German.....@ 8 @ 10 1/2

Orange Mineral, American.....@ 8 @ 8 1/2

Red, Indian, English.....@ 4 1/2 @ 8 1/2

Red, Indian, American.....@ 3 @ 3 1/2

Red, Turkey, English.....@ 4 @ 6

Red, Tuscan, English.....@ 7 @ 10

Red, Venetian, Amer.....@ 100 @ 1.75

Red Venetian, English.....@ 100 @ 1.80

Sienna, Italian, Burnt and

Powdered.....@ 3 1/2 @ 7 1/2

Sienna, Ital. Raw.....@ 3 1/2 @ 7 1/2

Sienna, American, Raw.....@ 1 1/2 @ 2

Sienna, American, Burnt and

Powdered.....@ 1 1/2 @ 2

Talc, French.....@ 100 @ 1.25

Talc, American.....@ 80 @ 1.10

Terra Alba, French.....@ 100 @ 1.00

Terra Alba, English.....@ 95 @ 1.00

Terra Alba, American No. 1.....@ 85 @ 85

Terra Alba, American No. 2.....@ 45 @ 50

Umber, Turkey, Bnt. & Pow.....@ 2 1/2 @ 3 1/2

Umber, Turkey, Raw & Powd.....@ 2 1/2 @ 3 1/2

Umber, Raw, Amer.....@ 1 1/2 @ 2

Umber, Raw, Amer.....@ 1 1/2 @ 2

Yellow, Chrome.....@ 10 1/2 @ 25

Vermilion, American Lead.....@ 10 @ 40

Vermilion, Quicksilver, bulk.....@ 70

Vermilion, Quicksilver, bags.....@ 71

Vermilion, English, Import.....@ 80 @ 95

Vermilion, Chinese.....@ 1.05 @ 1.20

Colors in Oil.

Black, Lampblack.....@ 12 @ 14

Blue, Chinese.....@ 36 @ 40

Blue, Prussian.....@ 32 @ 38

Blue, Ultramarine.....@ 13 @ 16

Brown, Vandyke.....@ 9 1/2 @ 13

Green, Chrome.....@ 10 @ 12

Green, Paris.....@ 2 1/2 @ 3

Sienna, Raw.....@ 10 @ 13

Sienna, Burnt.....@ 10 @ 13

Umber, Raw.....@ 9 1/2 @ 12

Umber, Burnt.....@ 9 1/2 @ 12

Miscellaneous.

Barytes, Foreign, # ton.....\$19.00 to \$31.00

Barytes, Amer. float.....\$19.00 to \$30.00

Barytes, Crude, No. 1.....\$4.00 to \$10.00

Chalk, in bulk.....\$2.50 to \$2.80

Chalk, in bbls.....\$100 @ 35

China Clay, English.....\$12.00 to \$17.50

Cobalt, Oxide.....\$100 @ 2.30

Whiting, Common.....\$100 @ .80

Whiting, Gliders.....\$45 @ .65

Whiting, extra Gliders.....\$55 @ .55

Putty.

In bladders.....\$2.25

In bulk.....\$1.25

In cans, 1 lb to 5 lb.....\$3.25

In cans 12 lb to 25 lb.....\$2.25

Spirits Turpentine.

In Southern bbls.....37 1/2 to 39 1/2¢

In machine bbls.....35 1/2 to 39 1/2¢

Glue.

Cabinet.....\$11 1/2 @ 16

Extra White.....\$18 @ 33

French.....\$12 @ 40

Irish.....\$13 1/2 @ 16

Low Grade.....\$9 @ 12

Medium White.....\$14 1/2 @ 16

Animal, Fish and Veget-

table Oils.

Linseed, City, raw.....\$5 @ 55

Linseed, City, boiled.....57 @ 58

Linseed, State and West, raw.....53 @ 54

Linseed, raw Calcutta see 1.....55

Lard, Prime.....78 @ 80

Lard, Extra No. 1.....52 @ 51

Lard, No. 1.....45 @ 46

Cotton-seed, Crude.....@

Cotton-seed, Summer Yellow,

prime.....39 @ 40

off grades.....37 1/2 @ 38

Sperm, Crude.....@

Sperm, Natural Spring.....60 @ 61

Sperm, Bleached Spring.....61 @ 62

Sperm, Natural Winter.....61 @ 62

Sperm, Bleached Winter.....65 @ 66

Tallow, Prime.....61 @ 61 1/2

Whale, Crude.....@

Whale, Natural Winter.....45 @ 46

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DECEMBER 11, 1901.

IRON AND STEEL—
Bar Iron from Store—

Merchant Steel from Store—

Soft Steel Sheets—

Sheet Iron from Store.
Black.

Russia, Planché, &c.

Galvanized.

Foreign Steel from Store—

METALS—

Tin Plates—

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Coke Plates

.....112 sheets..

Ingot—